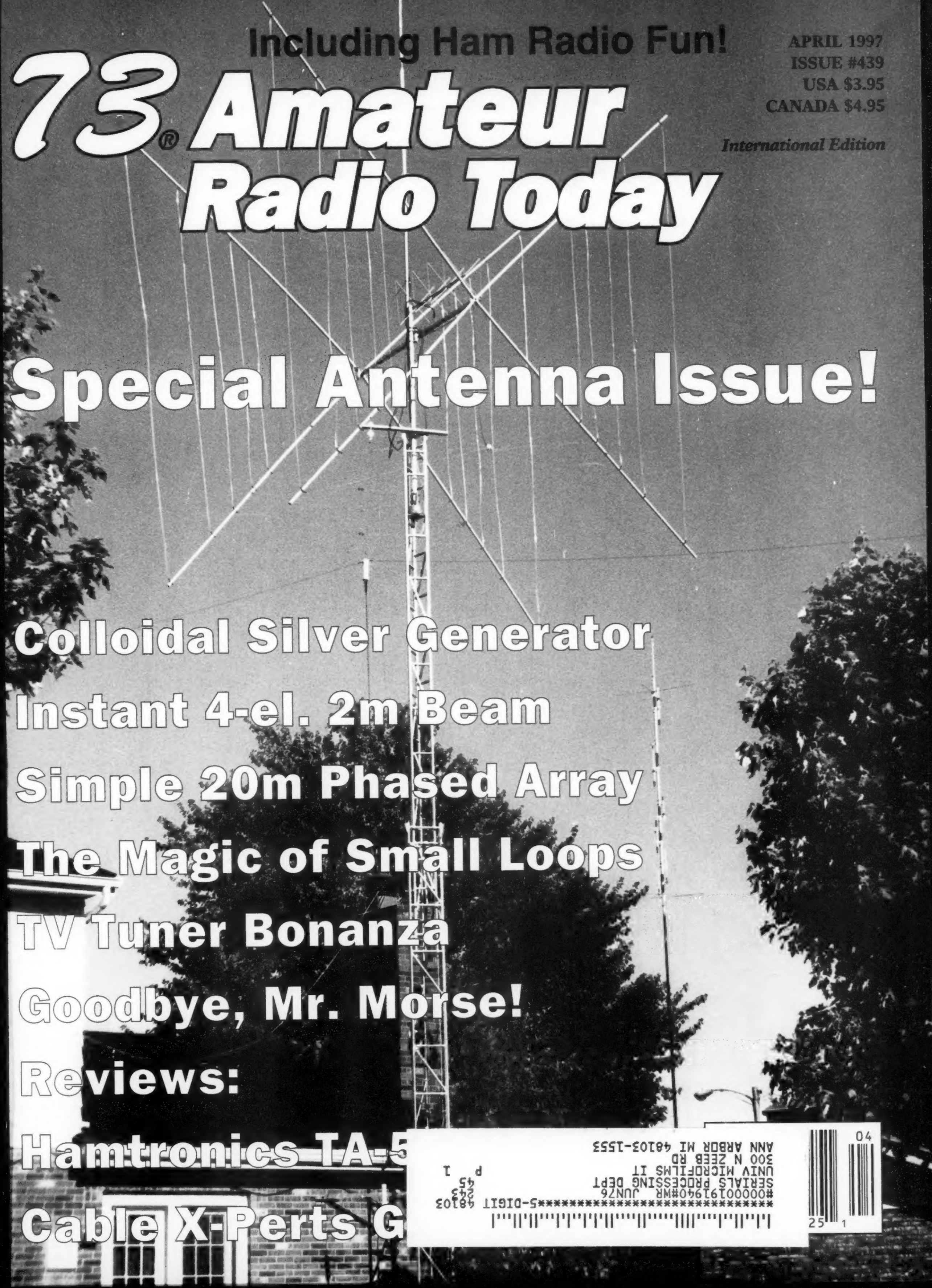


Including Ham Radio Fun!

APRIL 1997
ISSUE #439
USA $3.95
CANADA $4.95

International Edition

73® Amateur Radio Today

Special Antenna Issue!

Colloidal Silver Generator

Instant 4-el. 2m Beam

Simple 20m Phased Array

The Magic of Small Loops

TV Tuner Bonanza

Goodbye, Mr. Morse!

Reviews:

Hamtronics TA-5

Cable X-Perts G

04
*************5-DIGIT 48103
#0000191940#MR JUN76 243
45
SERIALS PROCESSING DEPT
UNIV MICROFILMS IT P 1
300 N ZEEB RD
ANN ARBOR MI 48103-1553
25 1

Finally – A Professional-Quality Receiver to Monitor Weather Broadcasts!

NEW Our new RWX is a very sensitive and selective Hamtronics® grade receiver to monitor critical NOAA weather broadcasts.

Excellent 0.15µV sensitivity provides good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast.

Essential for airports, police and fire departments, CAP, broadcast stations, state and local emergency managers, amateur repeaters – anyone needing a professional quality receiver. Because of its reasonable price, it is also handy for bikers, hikers, boaters, hunters, farmers – or anyone who needs up-to-date weather info and emergency warnings, even from distant stations.

Small enough for emergency or portable use, it can even be powered from a small 9-12V battery when needed. Crystal controlled for accuracy; **all 7 channels provided** (162.40 to 162.55).

You can buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. It is also available factory wired and tested.

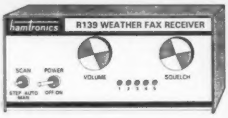
- RWX Rcvr kit, PCB only $79
- RWX Rcvr kit with cabinet, speaker, & AC adapter $99
- RWX Rcvr wired/tested in cabinet with speaker & adapter.....$139

WWV RECEIVER

NEW Get time and frequency checks without buying multiband hf rcvr. Hear solar activity reports affecting radio propagation. Very sensitive and selective crystal controlled superhet, dedicated to listening to WWV on 10.000 MHz. Performance rivals the most expensive receivers.

- **RWWV Rcvr** kit, PCB only $59
- **RWWV Rcvr** kit with cabt, spkr, & 12Vdc adapter $89
- **RWWV Rcvr** w/t in cabt with spkr & adapter $129

WEATHER FAX RECEIVER



Join the fun. Get striking images directly from the weather satellites! A very sensitive wideband fm receiver **optimized for reception of NOAA APT and Russian Meteor weather fax** images on the 137 MHz band.

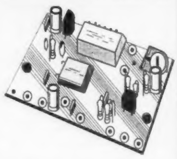
The R139 is lower cost and easier to maintain than synthesized units. And it is designed from the ground up for optimum satellite reception; not just an off-the-shelf scanner with a shorted-out IF filter!

Covers all five satellite channels. Scanner circuit and recorder control allow you to automatically search for and tape signals as satellites pass overhead, even while away from home.

- **R139 Receiver Kit** less case $159
- **R139 Receiver Kit** with case and AC power adapter..................$189
- **R139 Receiver w/t** in case with AC power adapter....................$239
- Internal PC Demodulator Board and Imaging Software $289
- Turnstile Antenna $119
- Weather Satellite Handbook $20

SUBAUDIBLE TONE ENCODER/DECODER

NEW Access all your favorite closed repeaters with TD-5 CTCSS Encoder/Decoder

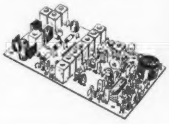


Encodes all standard subaudible tones with crystal accuracy and convenient DIP switch selection. Comprehensive manual also shows how you can set up a front panel switch to select between tones for several repeaters. Receiver **decoder** can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying buzz in receiver.

- **TD-5** CTCSS Encoder/Decoder Kit .... only $39
- **TD-5** CTCSS Encoder/Decoder Wired/tested $59

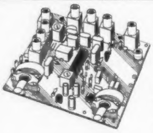
HIGH QUALITY VHF & UHF FM XMTR AND RCVR MODULES

FM EXCITERS: 2W output, continuous duty.



- **TA51:** for 6M, 2M, 220 MHz .. **kit $99, w/t $169.**
- **TA451:** for 420-475 MHz. .... **kit $99, w/t $169.**
- **TA901:** for 902-928 MHz, (0.5W **out**).......**w/t $169.**

VHF & UHF POWER AMPLIFIERS.
Output levels from 10W to 100W **Starting at $99.**



FM RECEIVERS:

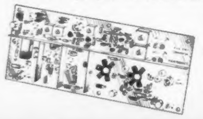
- **R100 VHF FM RECEIVERS** Very sensitive – 0.15µV. Superb selectivity – both crystal and ceramic IF filters, >100 dB down at ±12kHz, best available anywhere, flutter-proof squelch. For 46-54, 72-76, 140-175, or 216-225 MHz. .... **kit $129, w/t $189**
- **R144/R220 RCVRS.** Like R100, for 2M or 220 MHz, with helical resonator in front end.....**kit $159, w/t $219**
- **R451 FM RCVR,** for 420-475 MHz. Similar to R100 above. ....**kit $129, w/t $189**
- **R901 FM RCVR,** 902-928MHz ....**$159, w/t $219**

TRANSMITTING AND RECEIVING CONVERTERS

Go on a ham satellite adventure! Add another band for the next contest. Thrill in the excitement of building your own gear, and save a bundle.

No need to spend thousands on new transceivers for each band!

- Convert vhf and uhf signals to/from 10M.
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Kits from $49, wired/tested units only $99.

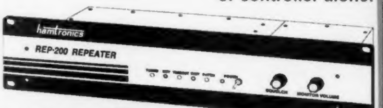


- Xmitting converters (at left) for 2M, 432 MHz.
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W output.

Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!



- ***kit still only $1095***
- ***factory assembled still only $1295***

50-54, 143-174, 213-233, 420-475 MHz. (902-928 MHz slightly higher.)
FCC type accepted for commercial service in 150 & 450 MHz bands.

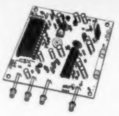
Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** .... only $100.

REP-200C Economy Repeater. **Real-voice ID**, no dtmf or autopatch. .... Kit only $795, w&t $1195.

REP-200N Repeater. Without controller so you can use your own. .... Kit only $695, w&t $995.

You'll KICK Yourself If You Build a Repeater

Without Checking Out Our Catalog First!



Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer. ....**only $49/kit, $79 w/t**

CWID. Traditional diode matrix ID'er. ....**kit only $59**

CWID-2. Eprom-controlled ID'er. ..**only $54/kit, $79 w/t**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. ...... **$59/kit, $99 w/t**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. ......**only $99/kit, $149 w/t**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. .... **kit only $99, w/t only $149**

COR-5. µP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. .... **$379 w/t**

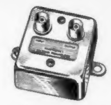
AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. .... **kit $89**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. .... **kit $79**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor. Can also use for selective calling; mute speaker until someone pages you. .. **kit $49**

LOW NOISE RECEIVER PREAMPS

LNG-( ) G_AA_S FET PREAMPS
STILL ONLY $59!



- Make your friends sick with envy! Work stations they don't even know are there.
- Install one at the antenna and overcome coax losses.
- *Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.*

LNW-( ) ECONOMY PREAMPS
ONLY $29 kit, $44 wired/tested

- Miniature MOSFET Preamp
- Solder terminals allow easy connection inside radios.
- *Available for 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, and 400-500 MHz bands.*

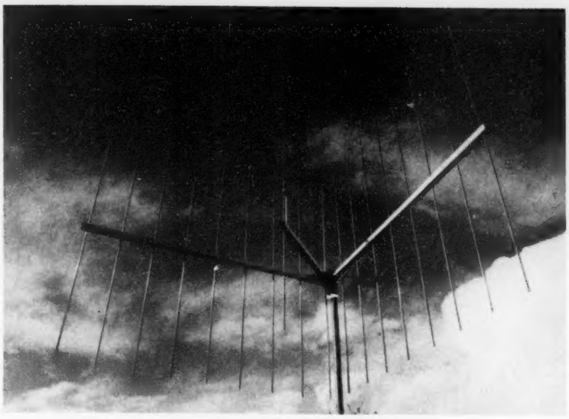
- Buy at low, factory-direct net prices and save!
- For complete info, call or write for free catalog.
- Order by mail, fax, or phone (9-12 AM, 1-5 PM eastern time).
- Min. $5 S&H charge for first pound plus add'l weight & insurance.
- Use VISA, Mastercard, Discover, check, or UPS C.O.D.

View Catalog on our Web site:
www.hamtronics.com
e-mail: jv@hamtronics.com

Our 35th Year!
hamtronics, inc.
65-D Moul Rd; Hilton NY 14468-9535
Phone 716-392-9430 (fax 9420)

Corner Beam?

Big Forward Gain
Wide Backward Rejection
Exceptional Bandwidth
Distortion Free Pattern



Your antenna makes all the difference at VHF and UHF—It determines transmitting range. It sets the limit for weak signal reception. And it decides what interference you'll hear and create.

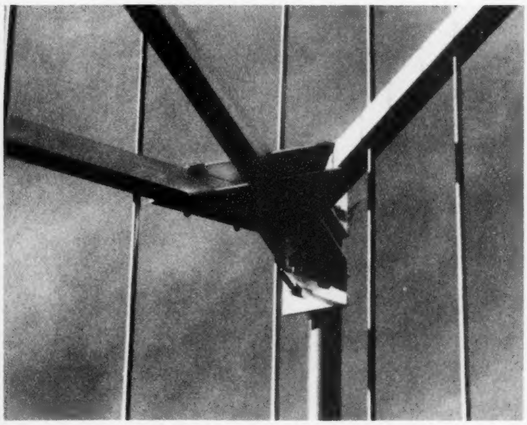
An omnidirectional antenna radiates uniformly in all direction, and it also hears noise and interference from every direction.

A directional antenna not only sends your signal where you want, it hears the signal it's pointed at, rejecting others. It also lets you operate with minimal power, cutting interference you inflict on other stations.

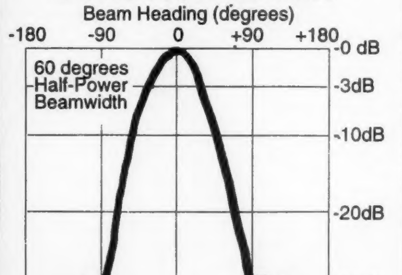
CornerBeam's clean sharp pattern without sidelobes or spikes reaches past the noise and interference to get the message through. Its wide rear rejection lets you null out strong nearby signals to reduce interference.

Look what CornerBeam does:

- 10 dB gain vs. dipole
- 40 dB Front-to-Back
- 60 degree Half-power Beamwidth
- SWR <1.1:1 across the band
- No dimension over 4 ft
- Mounts directly to mast or tower
- Vertical or horizontal polarization
- No need for offset or side mount



Measured CornerBeam Pattern



Corner Beats Yagi

A yagi with the same gain would have a 10-ft boom. Yagi bandwidth would be less than half. More important, CornerBeam produces no side lobes, no back lobes.

Improved Data Communication

Because CornerBeam's pattern has no unwanted side spikes, phase noise is reduced to a minimum. The result is reduced data error rate, faster packet circuits. When you want a distortion free signal, think CornerBeam, not yagi.

CornerBeam for Repeaters

If your repeater shares a frequency with another, the deep wide null toward the rear could keep your signal out of the neighboring repeater's receiver and turn a deaf ear to its signal. A pair of CornerBeams can be combined to privide special radiation footprints. A CornerBeam aimed at an area your repeater hears poorly could improve service where incoming signals from HTs are presently too weak. CornerBeam makes it possible to increase repeater density while reducing interference.

Bandwidth Pays Off

With its exceptional bandwidth, your CornerBeam can be put to work right out of the box without special tweaking. It can serve you now when you're working repeaters with an FM handheld, and later when you set out to work satellites or go after small signal DX at 144.2 MHz.

CornerBeam can still be your beam when you join MARS at 143/148 MHz or team up with the sheriff's communications interface team at 158 MHz.

Scanning Too?

CornerBeam's gain & bandwidth extend monitoring range from aircraft to to marine & public service frequencies.■

On the Internet
www.itsnet.com/~radventr

Corner Beam Models

Band	Max Dim	WindLd	Price
2 meters	4 ft	<2 sqft	$145
220 MHz	4 ft	<1 sqft	$145
70 cm	3 ft	<1 sqft	$115
Dual 146/435	4 ft	<3 sqft	$165

Construction: Aircraft aluminum. Booms are square. Elements are solid rod. Stainless hardware included for tower and mast mounting accepts up to 1.5" dia. mast and may be rotated for vertical or horizontal polarization. Connector is SO-239 for VHF, N female for UHF. Dual-Band antenna has separate driven elements, weighs only 10 pounds.

Dimensions given in table are for reflector elements & booms.

Options: Commercial Frequency $45.

Duplexer: Add $80 for VHF/UHF Duplexer and cabling for single coax feed of Dualband 146/435 Corner.

Shipping: UPS ground to continental USA ($11 S&H). Air Parcel Post to HI, AK, & Posessions ($14 P&H). Canada ($16 P&H). Allow 2 weeks for delivery.

☐ Yes, I want Performance in My Corner!

___Send my CornerBeam: __2m, __220MHz, __70 cm, __Dual 146/435.
___Options: __DualBand Duplexer, __Commercial/Marine. Frequency:_____
Name______________________________Amt. Enclosed_______
Call______________________ Phone____________________
Street________________________________ Unit_______
City_______________________ State______Zip________

AntennasWest
Box 50062-S Provo UT 84605

InfoPak
$1

Tech 801 373 8425 Fax 801 373 8426
Order Hotline **800 926 7373**

CIRCLE 57 ON READER SERVICE CARD

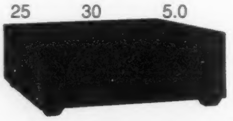
ASTRON CORPORATION

9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826

NEW

SWITHCHING POWER SUPPLIES

	CONT.	ICS	WT.(LBS)
SS-10	7	10	3.2
SS-12	10	12	3.4
SS-18	15	18	3.6
SS-25	20	25	4.2
SS-30	25	30	5.0



ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

- LOW PROFILE POWER SUPPLY

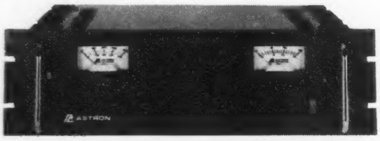
MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

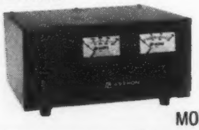
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

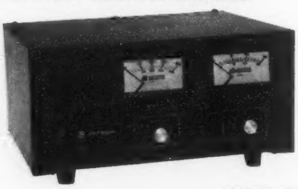
RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES



MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	 @10VDC	 @5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
VS-70M	67	34	16	70	6 x 13¾ x 12⅛	48
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

THE TEAM

El Supremo & Founder
Wayne Green W2NSD/1

Associate Publisher
F. I. Marion

Associate Technical Editor
Larry Antonuk WB9RRT

Nitty Gritty Stuff
J. Clayton Burnett
Priscilla Gauvin
Joyce Sawtelle
David Underwood

Contributing Culprits
Bill Brown WB8ELK
Mike Bryce WB8VGE
Joseph E. Carr K4IPV
Michael Geier KB1UM
Jim Gray W1XU/7
Chuck Houghton WB6IGP
Dr. Marc Leavey WA3AJR
Andy MacAllister WA5ZIB
Dave Miller NZ9E
Joe Moell K0OV
Carole Perry WB2MGP

Advertising Sales
Frances Hyvarinen
Roger Smith
603-924-0058
800-274-7373
Fax: 603-924-8613

Circulation
Linda Coughlan
Helen Senechal

Data Entry & Other Stuff
Christine Aubert
Norman Marion

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
73 Amateur Radio Today Magazine
70 Route 202N
Peterborough NH 03458-1107
603-924-0058
Fax: 603-924-8613

Reprints: $3 per article
Back issues: $5 each

Printed in the USA by
Quad Graphics

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made upon publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens must include their Social Security number with submitted manuscripts so we can submit it to you know who.

73® Amateur Radio Today

Including Ham Radio Fun!

APRIL 1997
ISSUE #439

TABLE OF CONTENTS

FEATURES

10 **The Hale-Bopp Comet and Its Controversial Tale – WA8YKN**
Build the Cosmic Crystal Set and listen in!

18 **TV/VCR Tuner Applications – W6WTU**
The first of a three-part series.

21 **Build a Colloidal Silver Generator – WA8YKN**
Do-it-yourself has always been at the heart of hamdom.

27 **An 8088 Clock Upgrade – Davis, W7RXV**
Recycle!

28 **The California Phased Array – W7DE**
Easy to build, easy to use—and even easier on the billfold!

32 **Kindergarten, a Two-Wheeler, and a Ham License – N0BLX, KB0YXB**
It's fun, and very handy, to have more than one amateur radio operator in the family.

34 **Mini-Grid DXpedition to FM13 –KB4NVD**
Sand, sun, & almost too much surf!

36 **Limit Morse Code Testing to 5 Wpm – KB7PNQ**
For any class of amateur radio license.

42 **Small Loop Design for HF QRP –WV8R**
A practical approach.

44 **Power Monitor/Distribution Panel – KB4ZGC/W4LJD**
Build this early warning system.

48 **The Insta-Flex 2 Meter Yagi Beam –KB7WOS**
Right at home in awkward places.

REVIEWS

26 **Cable X-Perts' G5RV Multiband Antenna Kit – N0BLX**
What to do when you're tired of making do.

40 **Hamtronics' TA-51 Exciter Kit – WB9RRT**
Perk up your foxhunts with this project.

DEPARTMENTS

WB6IGP 79 Above & Beyond
73 Ad Index
KB1UM 56 Ask Kaboom
85 Barter 'n' Buy
K4IPV 62 Carr's Corner
88 Ham Help
WB2MGP 57 Hams With Class
NZ9E 53 Ham to Ham
K0OV 76 Homing In
6 Letters
W2NSD/1 4 Never Say Die
86 New Products
W1XU 87 Propagation
WB8VGE 60 QRP
8 QRX
52, 63, 69, 88 Radio Bookshop
WA3AJR 82 RTTY Loop
51 Special Events

HAM RADIO FUN SECTION

K2OAW 64 **Communications Simplified, Part 16**

W6WTU 70 **Quartz Crystals**
An overview of these frequency controllers.

AD5X 74 **10 Meters Lives!**
Don't let the sunspot cycle fool you.

On the cover: Northern Kentucky QTH of proud owner Jim Brown AE4EY features 45-foot, crank-up, tilt-over, all-aluminum Aluma-tower; 5-band, 2-element HF quad by Lightning Bolt Antennas: 4-element 2m quad, also by Lightning Bolt, nested inside the HF quad; 2m Cushcraft Tingo atop the mast; multi-band Radio Works Carolina Windom supported by a cross-arm from the tower in a flat-top configuration; and (whew!) Cushcraft R7 multi-band vertical mounted on top of a fence off to the right. The tower is mounted on a tilt-over base and raised and lowered via a cable through a pulley attached to the chimney and then fastened to a car bumper. (Another tower-pulley-cable tale—involving insurance—appears on page 84.)

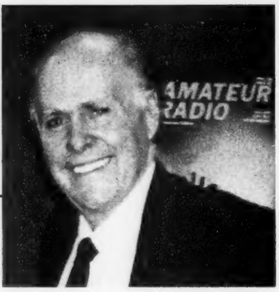
Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by 73 Magazine, 70 N202, Peterborough NH 03458-1107. The entire contents ©1997 by 73 Magazine. No part of this publication may be reproduced without written permission of the publisher, which is not all that difficult to get. The subscription rate is: one year $24.97, two years $44.97; Canada: one year $34.21, two years $57.75, including postage and 7% GST. Foreign postage: $19 surface, $42 airmail additional per year, payable in US funds on a US bank. Second class postage is paid at Peterborough, NH, and at additional mailing offices. Canadian second class mail registration #178101. Canadian GST registration #125393314. Microfilm edition: University Microfilm, Ann Arbor MI 48106. POSTMASTER: Send address changes to *73 Amateur Radio Today*, 70 N202, Peterborough NH 03458-1107. 73 Amateur Radio Today is owned by Shabromat Way Ltd. of Hancock NH.

Contract: By being so nosey as to read this fine print, you have just entered into a binding agreement with *73 Amateur Radio Today*. You are hereby obligated to do something nice for a ham friend—buy him a subscription to *73*. What? All of your ham friends are already subscribers? Donate a subscription to your local school library!

NEVER SAY DIE

Wayne Green W2NSD/1



The Handwriting

A couple of things almost got me to thinking. One was a well-considered letter by Ken W8VWZ wherein Ken made a very good case for those who believe that keeping the code test as an obstacle to keep new hams from joining our fraternity is sounding the death knell for amateur radio. The other was a review of the license statistics over the last ten years.

I did a hasty addition of the number of Extra/Advanced/General licenses as a percentage of the total licenses and found that the percentage of encoded hams has been dropping steadily, dropping from 61.6% in 1986 to 44.2% in 1996, and this was a straight curve drop. If I then subtracted in the number of hams who have dropped out of the hobby, either from a lack of interest or through death, which the FCC's ten-year licensing system ignores, the percentage is more like 38.8%, and that brings us to our having about 16% HFers in ten more years—unless we make some serious changes. I have seen no hint of any proposed changes coming from the ARRL. Have you?

And we'll be down to 10% in 13 years! Well, that'll certainly reduce the QRM on the HF bands!

This drop in HF hams explains why so many ham radio stores have been going out of business, and why the manufacturers of HF equipment have been having such a tough time. Our new no-code hams have an average ham station investment in the hundreds of dollars, while HFers tend to be more in the thousands.

I don't know how much of a difference getting rid of the code requirement might make, but polls of the no-coders tell us that this is the main obstacle to their upgrading. And considering the potential for us to lose our UHF and VHF bands, Ken could well be right that the Old Guard intransigence on maintaining the code barrier will be the death of amateur radio.

Sure, the Internet is already making DXing easier than fighting the QRM on 20m. And the profusion of commercially made ham gear has discouraged building, which has, in turn, made our access to parts more difficult. But we still have a world of adventure to offer the motivated.

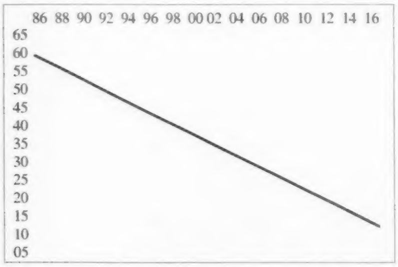


Fig. 1. Here's the percentage of General/Advanced/Extra Class (code barrier) licensees plotted from 1986 to 1996. This projects to about 8% by 2016, unless the code barrier is removed or the hobby is discontinued as no longer relevant. The ARRL destroyed the American ham industry and our recruitment of youngsters 30 years ago; now they're destroying the hobby and themselves. I wish I were exaggerating.

More Bio-E News

An Ohio reader who's been using the Bioelectrifier (*73*, May 1996) reports more black hairs on his head, teeth and gums improved, the first improvement in his nearsightedness since early childhood, better night vision, improved elimination ("It feels great to be normal for the first time in 72 years!"). I'm getting similar health improvement reports from around the country. Even if all these are just the placebo effect, it's still worth the time and trouble. Have you built one yet?

Now I realize that most Americans have been reduced to gutless wimps by our compulsory school system, but a few hams seem to have survived the 12 to 16 years of brainwashing with their sense of curiosity not totally destroyed, so I have hopes that the Bioelectrifier, which may turn out to be the medical industry's worst nightmare (an inexpensive cure for expensive illnesses), will get a fair trial. In the meanwhile, we can expect the usual ridicule, denunciation and persecution of the pioneers.

Yes, there are some commercial suppliers of the plant growth stimulator for those for whom even this simple device is too much to whip together.

Will this simple gadget be able to cure AIDS, and help rebuild immune systems to counter cancer, lupus, Lyme disease, and a bunch of other illnesses? Well, I don't yet believe in miracles, but I'll be surprised if almost any chronic illness can't be cured by a combination of stopping the input of poisons into the body, providing it with the nutrition it has been designed over millions of years to work with, with some help from the Bioelectrifier, and maybe some magnets, as we learn more about how they work. Oh yes, add in some prayer, because that has been proven to help. And a reduction of stress, since every illness has a psychological component. If we treat the body right we should be able to get another 20-30 years of good dependable service out of it over today's average.

The Freon Hoax

Congress has done it to us again! Did you get sucked in, as did Congress and President Bush, on the Freon hoax? Remember all that total hogwash about Freon eating up the ozone. Well, just by the damnedest coincidence this brouhaha, pushed by the greenies, came along at the same time as DuPont's patents for Freon were expiring. Talk about serendipity! Talk about billions of dollars in profits!

Freon can no longer be made since our beloved government now classifies it in about the same category as cocaine. So now a new and less efficient refrigerant is being used. Care to make a wild guess as to what company owns the patents on it? Oh, you peeked.

It turns out that scientists tell us that Freon leakage was environmentally insignificant since the chlorine molecule involved is heavier than air and sinks instead of rises. The evaporation of sea water releases infinitely more chlorine. Maybe Congress can put a stop to that by desalinating the oceans.

Yes, and by another unbelievable coincidence, DuPont is a major contributor to greenie groups. Who says altruism doesn't pay off? Big! I defy you to cite any major corporate altruism that isn't profitable.

Congress is driven by big business, and big business is driven by profits, even if they have to bribe a few greenies along the way to help move Congress in the "right" direction. As I've mentioned, every industry I've gotten involved with has turned out to be crooked, once I got to know the players. Capitalism is the best system we've found, but it sure isn't perfect.

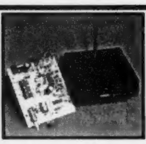
Well, you keep re-electing Congress, so smile when you are paying the bill for a Freon substitute.

School Costs

There are several benefits we expect to derive from being a citizen of a country. Like a set of laws and their enforcement which help us to live in peace with each other. Like protection from foreign attack. Like an infrastructure which allows us a good lifestyle. That might include services such as sewer, water, power, roads, food supply, clean air, law enforcement, firefighting, and so on. These are

Continued on page 38

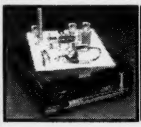
Synthesized FM Stereo Transmitter



Microprocessor controlled for easy freq programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island! New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized FM Stereo Transmitter Kit	**$129.95**

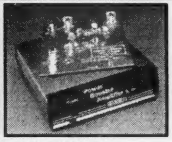
Tunable FM Stereo Transmitter



A lower cost alternative to our high performance transmitters. Offers great value, tunable over the 88-108 MHz FM broadcast band, plenty of power and our manual goes into great detail outlining aspects of antennas, transmitting range and the FCC rules and regulations. Connects to any cassette deck, CD player or mixer and you're on-the-air, you'll be amazed at the exceptional audio quality! Runs on internal 9V battery or external power from 5 to 15 VDC, or optional 120 VAC adapter. Add our matching case and whip antenna set for a nice finished look.

FM-10A, Tunable FM Stereo Transmitter Kit	**$34.95**
CFM, Matching Case and Antenna Set	**$14.95**

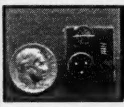
RF Power Booster Amplifier



Add some serious muscle to your signal, boost power up to 1 watt over a frequency range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM Stereo transmitters, providing radio service through an entire town. Power required: 12 to 15 volts DC at 250mA, gain of 38dB at 10 MHz, 10 dB at 1000 MHz. For a neat, professionally finished look, add the optional matching case set.

LPA-1, Power Booster Amplifier Kit	**$39.95**
CLPA, Matching Case Set for LPA-1 Kit	**$14.95**
LPA-1WT, Fully Wired LPA-1 with Case	**$99.95**

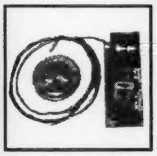
Micro FM Wireless Mike



World's smallest FM transmitter. Size of a sugar cube! Uses SMT (Surface Mount Technology) devices and mini electret condenser microphone, even the battery is included. We give you two complete sets of SMT parts to allow for any errors or mishaps-build it carefully and you've got extra SMT parts to build another! Audio quality and pick-up is unbelievable, transmission range up to 300 feet, tunable to anywhere in standard FM band 88 to108 MHz. 7/8"w x 3/8"h x 3/4"h.

FM-5 Micro FM Wireless Mike Kit	**$19.95**

Crystal Controlled Wireless Mike



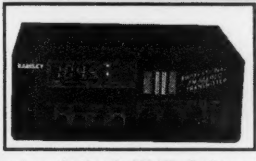
Super stable, drift free, not affected by temperature, metal or your body! Frequency is set by a crystal in the 2 meter Ham band of 146.535 MHz, easily picked up on any scanner radio or 2 meter rig. Changing the crystal to put frequency anywhere in the 140 to 160 MHz range-crystals cost only five or six dollars. Sensitive electret condensor mike picks up whispers anywhere in a room and transmit up to 1/4 mile. Powered by 3 volt Lithium or pair of watch batteries which are included. Uses the latest in SMT surface mount parts and we even include a few extras in case you sneeze and loose a part!

FM-6, Crystal Controlled FM Wireless Mike Kit	**$39.95**
FM-6WT Fully Wired FM-6	**$69.95**

Call for our Free Catalog !

RAMSEY

Super Pro FM Stereo Radio Transmitter

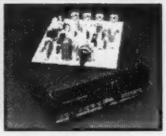


A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. Plus there's input low pass filtering that gives great sound no matter what the source (no more squeals or swishing sounds from cheap CD player inputs!) Peak limiters for maximum 'punch' in your audio - without over modulation, LED bargraph meters for easy setting of audio levels and a built-in mixer with mike and line level inputs. Churches, drive-ins, schools and colleges find the FM-100 to be the answer to their transmitting needs, you will too. No one offers all these features at this price! Kit includes sharp looking metal cabinet, whip antenna and 120 volt AC adapter. Also runs on 12 volts DC.

We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

FM-100, Professional FM Stereo Transmitter Kit	**$299.95**
FM-100WT, Fully Wired High Power FM-100	**$429.95**

Speech Descrambler Scrambler



Decode all that gibberish! This is the popular descrambler / scrambler that you've read about in all the Scanner and Electronic magazines. The technology used is known as speech inversion which is compatible with most cordless phones and many police department systems, hook it up to scanner speaker terminals and you're in business. Easily configured for any use: mike, line level and speaker output/inputs are provided. Also communicate in total privacy over telephone or radio, full duplex operation - scramble and unscramble at the same time. Easy to build, all complex circuitry contained in new custom ASIC chip for clear, clean audio. Runs on 9 to 15VDC, RCA phono type jacks. Our matching case set adds a super nice professional look to your kit.

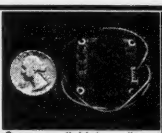
SS-70A, Speech Descrambler/Scrambler Kit	**$39.95**
CSS, Custom Matching Case and Knob Set	**$14.95**
SS-70AWT, Fully Wired SS-70A with Case	**$79.95**
AC12-5, 12 Volt DC Wall Plug Adapter	**$9.95**

Tone-Grabber Touch Tone Decoder / Reader

Dialed phone numbers, repeater codes, control codes, anywhere touch-tones are used, your TG-1 will decode and store any number it hears. A simple hook-up to any radio speaker or phone line is all that is required, and since the TG-1 uses a central office quality decoder and microprocessor, it will decode digits at virtually any speed! A 256 digit non-volatile memory stores numbers for 100 years - even with the power turned off, and an 8 digit LED display allows you to scroll through anywhere in memory. To make it easy to pick out numbers and codes, a dash is inserted between any group or set of numbers that were decoded more than 2 seconds apart. The TG-1 runs from any 7 to 15 volt DC power source and is both voltage regulated and crystal controlled for the ultimate in stability. For stand-alone use add our matching case set for a clean, professionally finished project. We have a TG-1 connected up here at the Ramsey factory on the FM radio. It's fun to see the phone numbers that are dialed on the morning radio show! Although the TG-1 requires less than an evening to assemble (and is fun to build, too!), we offer the TG-1 fully wired and tested in matching case for a special price.

TG-1, Tone Grabber Kit	**$99.95**
CTG, Matching Case Set for TG-1 Kit	**$14.95**
TG-1WT, Fully Wired Tone Grabber with Case	**$149.95**
AC12-5, 12 Volt DC Wall Plug Adapter	**$9.95**

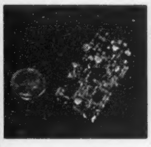
Mini-Peeper Micro Video Camera



Super small, high quality fully assembled B & W CCD TV camera the size of an ice cube! Provides excellent pictures in low light (2 lux), or use our IR-1 Infra-Red light source to invisibly illuminate an entire room on a pitch black night! Imagine the possibilities... build it into a smoke detector, wall clock, lamp, book, radio. Exact same camera that's in big buck detective catalogues and stores. Kit includes: fully assembled CCD camera module, connectors, interface PC board kit with proper voltage regulation and filtering, hook-up details, even a mini microphone for sensitive sound! Two models available: Wide Angle Lens 3.6mm/f2, adjustable focus lens, 92 degree view; Pinhole Lens 5.5mm/f4.5, 60 degree view. The Pinhole Lens is physically much flatter and provides even greater depth of focus. The camera itself is 1.2" square. The Wide Angle Lens is about 1" long, Pinhole Lens about 1/2", interface PC board is 1" x 2" and uses RCA jacks for easy hook-up to VCRs, TVs or cable runs. Power required is 9 to 14 VDC @ 150 mA. Resolution: 380 x 350 lines. Instruction manual contains ideas on mounting and disguising the Mini-Peeper along with info on adding one of our TV Transmitter kits (such as the MTV-7 unit below) for wireless transmission!

MP-1, Wide Angle Lens CCD TV Camera Outfit	**$169.95**
MP-1PH, Pin-Hole Lens CCD TV Camera Outfit	**$189.95**

MicroStation Synthesized UHF TV Transmitter



Now you can be in the same league as James Bond. This transmitter is so small that it can fit into a pack of cigarettes - even including a CCD TV camera and battery! Model airplane enthusiasts put the MTV-7A into airplanes for a dynamite view from the cockpit, and the MTV-7A is the transmitter of choice for balloon launches. Transmitter features synthesized, crystal controlled operation for drift-free transmission of both audio and video on your choice of frequencies: Standard UHF TV Channel 52 (which should only be used outside of the USA to avoid violating FCC rules), and 439.25 MHz or 911.25 MHz which are in the amateur ham bands. The 439.25 MHz unit has the nifty advantage of being able to be received on a regular 'cable-ready' TV set tuned to Cable channel 68, or use our ATV-74 converter and receive it on regular TV channel 3. The 911.25 MHz unit is suited for applications where reception on a regular TV is not desired, an ATV-79 must be used for operation. The MTV-7A's output power is almost 100 mW, so transmitting range is pretty much 'line-of-sight' which can mean many miles! The MTV-7A accepts standard black and white or color video and has its own, on-board, sensitive electret micorphone. The MTV-7A is available in kit form or fully wired and tested. Since the latest in SMT (Surface Mount Technology) is used to provide for the smallest possible size, the kit version is recommended for experienced builders only. Runs on 12 VDC @ 150 mA and includes a regulated power source for a CCD camera.

MTV-7A, UHF TV Channel 52 Transmitter Kit	**$159.95**
MTV-7AWT, Fully Wired Channel 52 Transmitter	**$249.95**
MTV-7A4, 439.25 MHz TV Transmitter Kit	**$159.95**
MTV-7A4WT, Fully Wired 439.25 MHz Transmitter	**$249.95**
MTV-7A9, 911.25 MHz TV Transmitter Kit	**$179.95**
MTV-7A9WT, Fully Wired 911.25 MHz Transmitter	**$269.95**
ATV-74, 439.25 MHz Converter Kit	**$159.95**
ATV-74WT, Fully Wired 439.25 MHz Converter	**$249.95**
ATV-79, 911.25 MHz Converter Kit	**$179.95**
ATV-79WT, Fully Wired 911.25 MHz Converter	**$269.95**

RAMSEY ELECTRONICS, INC.
793 Canning Parkway
Victor, NY 14564

Order Toll-free: 1-800-446-2295
Sorry, no tech info or order status at this number

Technical Info, Order Status
Call Factory direct: (716) 924-4560

VISA MasterCard DISCOVER

ORDERING INFO: Satisfaction Guaranteed. Examine for 10 days, if not pleased, return in original form for refund. Add $4.95 for shipping, handling and insurance. Orders under $20, add $3.00. NY residents add 7% sales tax. Sorry, no CODs. Foreign orders, add 20% for surface mail or use credit card and specify shipping method.

CIRCLE 34 ON READER SERVICE CARD

Number 6 on your Feedback card

LETTERS

From the Ham Shack

Les Hale W3LIV5. The December article by W8AHB on Nikola Tesla was certainly on the mark; he was clearly a great genius. As a licensed amateur for over 50 years, and electrical engineer for 44 years, I have never thought there was any argument about this, having learned his "rotating field" concepts in college in the early 1950s. I have always thought it was common knowledge that he was "right" and Edison "wrong" in the AC vs. DC debate.

However, I would question the need to knock Edison down to build up Tesla's reputation. Although not possessing the theoretical insights of Tesla, Edison did many notable things by applying the principles outlined in "A Perspirational Message" by W2NSD/1 in the same issue. It would appear that today this approach is still leading to advances in electrical science and engineering, although it is perhaps more widely used now in Japan where they still frequently take the approach of learning from everybody and trying everything to make new discoveries. Perhaps Tesla has suffered somewhat from the "mad scientist" image and the fact that he made one serious mistake in his ideas about the wireless transmission of power. I believe this is not quite as crazy as most people think, and could have been possible if the losses in the semiconducting region between the insulating lower atmosphere and conducting ionosphere had turned out to be much less. Actually, to get reasonable efficiency, the "Q" of the spherical cavity between the earth and the ionosphere would have to be extremely high. "Schumann resonance" measurements have shown this Q to be about 5, but Tesla could not have known this.

A "lossless" cavity would have had other implications for hams. Signals which easily propagated around the world many times would certainly lead to untenable QRM and "echo" effects, and entirely different communications systems would have evolved.

Orlo Hudson W5LVA. I am a long-time lifer reader. This is to suggest that you research and publish an article which will probably make that issue a collector's item.

I left 20m AM phone about 30 years ago and have been on 2m ever since. Now that I am retired, I would like to dust off some of that old equipment and put it back on the air, but there have been so many band changes and new services that I really don't know what bands I can work and what modulations are legal. I have an old Class A license—which they now call Advanced. I am not about to "upgrade." I was licensed in 1941!

How about publishing a comprehensive spectrum analysis of places where hams (not appliance operators) can build equipment, operate the equipment, and explore the science without being illegal.

Include all frequencies—not just the established ham bands. For example, the frequencies below 100 kc.

While you are at it, you might comment on these proposed projects: (1) A small linear amplifier to hang on a VCR and boost the channel 3/4 output to where it can be picked up throughout the house. How much power can you legally run? (2) A 1 kW transmitter centered on 1 mc, putting out true Spread Spectrum Modulation. The FCC can't receive the rig unless they are standing under the antenna with an untuned FS meter.

I am just full of such ideas, but I don't want to go to jail! I am not interested in a "rag chew" on some appliance; I want to build something different and test it...

Dennis L. Foster KK5PY. Thank you ever so much for such a great, unbiased, amateur radio magazine. I had been inactive in ham radio for years and had really forgotten what a great publication it is until I read a copy or two from a friend's collection.

Les Warriner WA7HAM. History Lesson—Battle Of Agincourt. The French, who were overwhelmingly favored to win the battle, threatened to cut a certain body part off of all captured English soldiers so that they could never fight again. The English won in a major upset and waved the body part in question at the French in defiance. What was this body part? The answer, which clears up some profound questions of etymology, folklore and emotional symbolism, is that the body part which the French proposed to cut off of the English after defeating them was, of course, the middle finger, without which it was impossible to draw the renowned English longbow. This famous weapon was made of the native English yew tree, and so the act of drawing the longbow was known as "plucking yew." Thus, when the victorious English waved their middle fingers at the defeated French, they said, "See, we can still pluck yew!" Over the years some "folk etymologies" have grown up around this symbolic gesture. Since "pluck yew" is rather difficult to say (like "pleasant mother, pheasant plucker," which is who you had to go to for the feathers used on the arrows), the difficult consonant cluster at the beginning has gradually changed to a labiodental fricative "f", and thus the words often used in conjunction with the one-finger salute are mistakenly thought to have something to do with an intimate encounter. It is also because of the pheasant feathers on the arrows that the symbolic gesture is known as "giving the bird." And yew all thought yew knew everything!

One of the perils of E-mail is being spammed with plucky stuff like this. However, it does answer a question I never thought to ask... Wayne.

Ron Hartoebben KB0PF. I received the current issue of *Cold Fusion* today and noticed your E-mail address. How have I missed that before, since I subscribe to *73* and *CF*? I recommend that you encourage E-mail submissions for your magazines. Publish your address more often. Maybe even develop a Web page. It should pay off for you. After all, you're already on AOL.

I enjoy your editorials. I use ideas from them often in my courses. Yes, I am a teacher (in a small parochial elementary school). I started teaching because I can afford to after retiring from another exciting profession.

The fellow who helped me most in ham radio was Bill Stocking W0VM, who wrote several articles for you. We used to test some of his antenna theories at my shack. I successfully encouraged him to try phone in lieu of his exclusive CW, and in his last few years he enjoyed all aspects of the hobby.

I am in the middle of three generations of ham radio, all in-laws. My father-in-law got his ticket in 1930 and is still active. We have great photos from his early ham days. My two sons-in-law are both hams and making names for themselves. My experiences have paralleled yours often. Even did a stint as local publicity director for Mensa.

Recently I helped a fellow develop a database for WW2 submarine vets and even found a couple local guys who were on the *Drum*. I hope someday to catch one of your talk show appearances. You ought to give some advance notice in your magazines, or better yet put it in your Web page. There I go again, giving you advice.

Number 21 on the list of my 73

most urgent projects is setting up a Web page... Wayne.

Bill Chatterly N1SGI. "Why do I have to study CW? I use SSB rarely, no RTTY, no SSTV, no repeater, no computer—I only use HF. I do not care what a resistor or a capacitor does."

I had to learn this as a requirement to get my license for HF. It is part of the hobby. Is not CW part of the requirement also? What shall we delete from the requirements next? Think about it. Good luck, FISTS!

Guy A. Matzinger KB7PNQ. One hundred fifty years ago the Russian liberal thinker, Alexander Hertzen, wrote that what he feared most was a "Genghis Khan with the telegraph." When Lenin seized power in Petrograd in 1917, his first objectives were the seat of government and the telegraph office.

When, several years ago, "Incentivised Licensing" defined the course of amateur radio, it became the central control and essence of the hobby—using telegraphy and high-speed code tests to decide operating privileges. This totalitarian control with its enormous ability to manipulate amateur radio has become increasingly static. However, opening shots in a war over who gets to dominate the hobby were fired in recent months. At issue is who shall control international rules and regulations for amateur radio—specifically Morse code testing. Those organizations who believe they are the icons of order—or each country?

With sphincter-tightening apprehension, pro-code advocates are lobbying and bullying the international community, warning of chaos and a possible collapse of amateur operations if Morse code testing requirements are removed as a *treaty* obligation. These mutterings hint that the established foundation of the hobby will be eroded if each country is allowed to set its own code testing standards—absurd—each country does that already. The real concern is that some democratic society may not want a code test for any class of license.

We must move away from the mental virus that Morse code is the basis that defines an amateur radio operator—as we moved, 60 years ago, from crank-starting a Model-T Ford to today's fuel-efficient cars. Pro-code organizations and media pundits, who support the closed-shop mentality of limiting participation, need to stop whining with nostalgia for a vanished world, implying that without a Morse code treaty requirement amateur radio is going to turn into a disaster. Denmark recognized the need to change and in July of 1996 reduced license classes from five to three and code testing to 5 wpm for any class of license. Once again the Danes lead the way—without calamity.

Have we become so accustomed to our freedoms being worn away by self-serving interest groups that we can no longer allow any other country to choose its own course of action? The value of democracy lies in its freedom to choose. Amateur radio operates as a microcosm of society and if it wishes to be a communications participant, and continue free use of the spectrum and all the valuable progeny of that gift, it must change. The dynamic future of this hobby depends on integrating tomorrow's technology with today's abilities.

If ever there was a case for social justice, eliminating international Morse code *treaty* requirements tops the list. I strongly urge each of you to write to: IARU FASC, c/o IARU International Secretariat, PO Box 310905, Newington CT 06131-0905—supporting the removal of Article §25.5 at WRC99 as a *treaty* obligation of administrations and the putting of fun back into amateur radio. Then, perhaps, we can have a secure tomorrow for the hobby. 73

1-800-TRU-HAMM (orders only)
(800-878-4266)
Local & Tech 1-810-771-4711, Service 1-810-771-4712, Fax Service 1-810-771-6546

Michigan Radio
SALES SERVICE

Terms do not include shipping. Price and availability subject to change without notice. Most orders shipped same day. COD's welcome ($5.50 & shipping)

OPEN
MON-FRI 10-6
SAT 10-4,
SUN CLOSED

23040 Schoenherr, Warren, MI 48089

See us at Dayton Hamfest '97 at our new location: Booths 476, 477, 478, & 479

Now on the World Wide Web http://www.michiganradio.com E-Mail at mirad@pbcs.com

Convert Excess Equipment to CASH We buy good clean, used equipment Estate Sales

QRX . . .

Number 8 on your Feedback card

Help Wanted: Dayton Youth Forum

New York City—Educator Carole Perry WB2MGP will be moderating the popular Dayton Youth Forum on May 17th. She is looking for articulate, enthusiastic young people (8–18 years of age) who would like to be presenters. Please call Carole at (718) 761-5733 as soon as possible.

Scholarships for Amateurs

The Foundation for Amateur Radio, Inc., a non-profit organization with headquarters in Washington DC, plans to administer 60 scholarships for the academic year 1997–1998 to assist licensed radio amateurs. The Foundation, composed of over 75 local area amateur radio clubs, fully funds five of these scholarships with the income from grants and its annual hamfest. The remaining 55 are administered by the foundation without cost to the various donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled in or have been accepted for enrollment at an accredited university, college or technical school. The awards range from $500 to $2,500, with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs. Amateur radio operators, especially those in DE, FL, ME, MD, NJ, OH, PA, TX, VA and WI, are encouraged to apply.

Additional information and an application form may be requested by letter or QSL card, postmarked prior to April 30, 1997, from: FAR Scholarships, 6903 Rhode Island Ave., College Park MD 20740.

The Foundation for Amateur Radio, incorporated in the District of Columbia, is an exempt organization under Section 501 (C)(3) of the Internal Revenue Code of 1954. It is devoted exclusively to promoting the interests of amateur radio and those scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

Found in Penn Wireless Assn.'s *X-Mitter*, January 1997.

FCC Enacts Internet Morse Code Requirement

The FCC, under pressure to clean up the Internet—especially after the Communications Decency Act provisions regarding Internet content regulation were stricken as violating the US Constitution—has decided instead to create a Morse code requirement for Internet users.

Citing the success of the Amateur Radio Service and the general belief that its requirement for operators to pass a Morse code proficiency exam and other technical requirements has kept the ARS "clean," the FCC has decided to enact a 5 wpm requirement for all Internet users. They are leaving open the issue of whether there should be a "codeless" class of Internet user and are soliciting comments on the proposal. Presumably, a "codeless" user would be restricted to Web pages published by household magazines and kitchen equipment suppliers, for example.

Persons wishing to develop Web sites that have actual content, as compared to just links to other Web sites, must pass a 20 wpm Morse proficiency test in HTML and the Java programming language, and show that they have mastery of at least one human language such as English or Esperanto.

The FCC, which lacks budgetary authority to implement the testing program, has stated that it intends to create Volunteer Examiner programs for Internet applicants.

From the *ARNS Newsletter*, February 1997; originally in *The Long Wire*, November 1996; special *merci* to French Ministry of PTT spokesman A. Prel F0OLE.

Hams on Duty in Western US Flooding

Ham radio has pitched in to help in the wake of serious flooding in the western US. In California, flooding 50 miles north of Sacramento resulted from a week of torrential rainfall. Tim Tribble JD6MDV, of the Sacramento CA City Fire Reserve RACES Operations Center, reported that his group was activated at noon on Friday, December 27th, and had been on 24-hour duty for an extended period thereafter. RACES operators have provided supplemental communications for the Fire Department, including relaying information about water levels at area dams. The hams also have been providing support services, and have even delivered food to out-of-state mutual aid groups.

Tribble reported that up to 40 area amateurs had been manning the command post. Other command posts were located at the Wilton Fire Department and at Station 59 in the Murietta/Sloughouse area of California.

One Saturday, seven operators were dispatched to the city of Marysville to assist the Department of Fish and Game in assessing livestock care needs. Another 10 were sent to aid the Red Cross in damage assessment.

Ham radio has also been assisting in flood recovery efforts in the northwest, including Oregon, Washington, and Nevada. In Oregon, long-distance telephone service to the Ashland-Grants Pass vicinity in the extreme southwestern portion of the state went down when a fiber optic cable was severed. Ham radio took over, linking the county via HF with the state emergency operations center in Salem. Oregon SEC Lew Williams WD7NML said Jackson and Josephine counties were the hardest hit. In Jackson County, hams helped provide communication at shelters. Williams said hams also pitched in during sandbagging operations. In Nevada, Dick Creley KJ7UK of Gardnerville reported hams were activated on New Year's Day and provided secondary communications for the Douglas County Sheriff's Department, the Emergency Management Office, and two shelters that housed some 50 residents. The approximately 30 hams in Douglas County and Carson City put in a total of 350 work-hours. Creley said damage was extensive, and the cities of Minden and Gardnerville were isolated. Bruce Pfeiffer N7CPP of Carson City said telephone service remained in operation, limiting the need for ham radio communication support. His wife, Sue Pfeiffer N7PRF, and Reed Ross W7HOP manned a station at the Carson City EOC, while he and Jo Ann Paul N7MBM, manned a station at a local Carson City shelter.

In Yerington NV, 17-year-old Carrick Dunn KB7OBE provided the only communication link between his town and the outside world.

TNX *The GCARC Wireless*, January 1997.

ARLS016 Ham Radio on Space Station

A foundation has been laid to give amateur radio a permanent presence in space. Late last year, amateur radio delegates from eight countries—Russia, Japan, Germany, Great Britain, Italy, Canada, France and the US—met at the NASA Johnson Space Center in Houston TX to map plans to include a permanent ham radio station aboard the International Space Station, to be tended by station crew members.

From the United States, members of the SAREX Working Group, officials from NASA, US representatives of the Russian *Mir* Amateur Radio experiment and members from the Johnson Space Center Amateur Radio Club attended the meetings November 4th and 5th, chaired by Roy Neal K6DUE. ARRL Vice President Joel Harrison W5ZN (ex-WB5IGF) represented the League at the gathering. SAREX Working Group member Rosalie White WA1STO, of the ARRL Headquarters staff, was among those on hand. The delegates jointly developed a draft memorandum of understanding to promote the development of Amateur Radio on the International Space Station—to be known as ARISS.

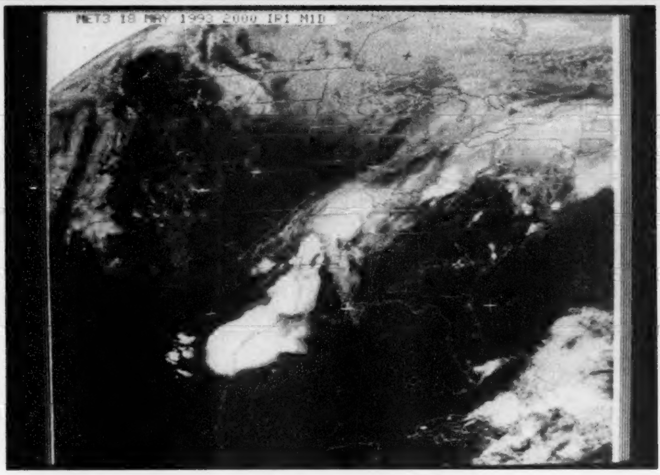
The ARISS group will provide for the planning, coordination and performance of amateur radio projects on the space station, similar to the way the SAREX Working Group currently coordinates amateur radio activities on many space shuttle missions. AMSAT and IARU organizations in each of the eight countries are to review and consider approving the memorandum of understanding. In the US, this includes AMSAT-NA and the ARRL.

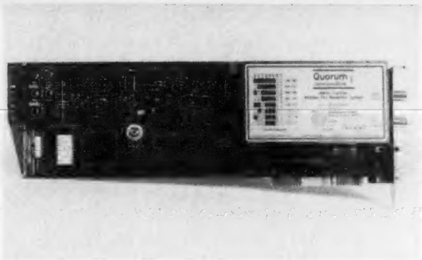
The AMSAT-NA Board unanimously approved the memorandum of understanding at its November 11th Board of Directors meeting in Tucson AZ. Once the memorandum is finalized, AMSAT-NA President Bill Tynan W3XO has been given authority by the board to sign it. AMSAT-NA Vice President for Manned Space Frank Bauer KA3HDO congratulated the international ARISS team for a job well done. "We look forward to a truly cooperative international venture on the International Space Station," he said.—de ARRL HQ, via Keith N3LDF.

TNX to *The Ham Arundel News*, January 1997.

Continued on page 84

Explore The World of Quorum Wefax





Wefax Explorer

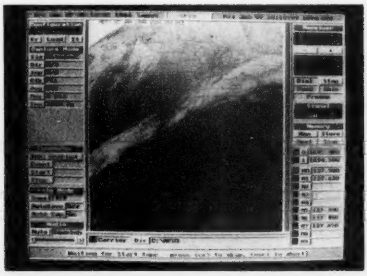
Integrated Wefax / APT Receiver and Scan Converter with Qfax software.

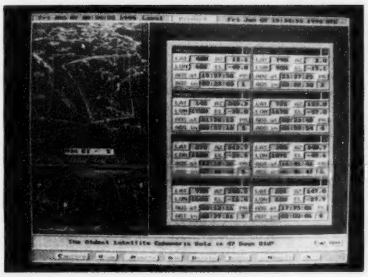
$695.00 complete

shipping and taxes not included

The Best Price / Performance. Period!

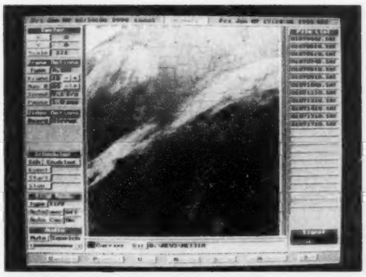
Construct a Wefax / APT reception system from individual component receivers, scan converters and image processing software and you'll spend more money for fewer features, poorer performance, no automation and a jungle of wires. With the Wefax Explorer, simply connect an antenna and a few mouse clicks later you're receiving the highest quality images possible. The Explorer is backed by a 1 year limited warranty and the extensive experience of the leading Wefax hardware manufacturer. Quorum equipment is used by virtually all wefax suppliers in worldwide amateur, commercial and military systems.

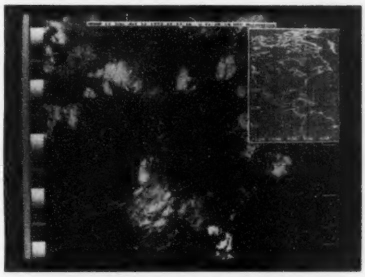




QFAX Features

- *GOES / Meteosat Wefax Reception*
- *NOAA / Meteor APT Reception*
- *HF Nafax Reception*
- *Dual RF ports for geosync and polar reception under software control*
- *Integrated preamp and down converter power inserters*
- *50 user definable configurations*
- *Software controlled receiver with 2 UHF, 10 VHF memories and scan*
- *On board audio amplifier and speaker with software controlled volume, squelch and mute*
- *Automatic Unattended Animation works continuously*
- *8 bit data for up to 256 gray levels*
- *View at up to 1280 x 1024 256 color*
- *Use TIFF, GIF or PCX file formats and convert to BMP, JPEG, EPS and binary*
- *Contrast, Brightness, 3D effect, Sharpen, Smooth, Noise, Histograms and other image processing*





- *Integrated Satellite visibility prediction with automatic capture for up to 8 satellites simultaneously*
- *Automatic time and ephemeris stamping for navigation*
- *2 7 day programmable schedulers*
- *Automatic digital gain lock in ALL modes, PLL clocking*

- *Ephemeris based NOAA APT navigation with geo-political and Lat-Lon overlays*
- *NOAA Tools show satellite path, Lat-Lon of cursor, distance and bearing to reference point*
- *Automatic Temperature Calibration*
- *Color Palettes and NOAA curves*

Quorum Communications, Inc. FAX(214) 915-0270

8304 Esters Blvd. - Suite 850 - Irving, Texas 75063 (214) 915-0256 BBS (214) 915-0346

CIRCLE 257 ON READER SERVICE CARD

The Hale-Bopp Comet and Its Controversial Tale

Build the Cosmic Crystal Set and listen in!

Thomas M. Miller WA8YKN
314 South 9th Street
Richmond IN 47374
E-mail: thomil@infocom.com

April 1997 marks the closest approach of the long-awaited Hale-Bopp comet, discovered on July 22, 1995 by amateur astronomers Alan Hale and Thomas Bopp. Although comets are notoriously unpredictable, this one shows every sign of becoming a bright, naked-eye object, perhaps even visible in the daytime! At the very least, the arrival of Hale-Bopp will be an event to remember.

Brightness, however, may not be the most interesting aspect of this object. Riding with Hale-Bopp is an intense storm of rumors and controversy which seems to intensify in direct proportion to the comet's proximity.

The first indication that Hale-Bopp was an "unusual" comet was its discovery: most comets are discovered only a few months away from their closest approach to the sun. The comet Kohoutek set a record in 1973, first seen seven months out. Hale-Bopp was first spotted an incredible 21 months away from Earth, an astounding 666 million miles out, beyond the orbit of Saturn! No comet ever discovered would be visible at that distance, even through the largest telescopes in the world. Hale-Bopp, however, was large and bright enough to be seen by *two* amateurs on the *same night... by accident!* Since the discovery, astronomers have searched old photographic plates and discovered that one shows the (then undiscovered) comet, an astonishing 40 *months* away!

> ***"Hams, known to wear hats sprouting antennas, don't embarrass easily, so in this case it's clearly up to us."***

Not only does Hale-Bopp appear to be the largest and brightest comet ever discovered, but its behavior defies explanation. The comet is far brighter than it should be at that distance from the sun, and it has regular outbursts of brightness, accompanied by huge jets of gas, dumping carbon dioxide at the rate of several tons per second. These outbursts occur every 19 days.

The controversy surrounding Hale-Bopp really began to heat up on November 16, 1996. Chuck Shramek, radio host and amateur astronomer, released a photograph of the comet which clearly showed a large object moving with Hale-Bopp. This object was round and sharp, with a curious "line" through it that made it resemble the planet Saturn with the rings on edge. The image soon found its way onto the Internet, and all "Hale" broke loose!

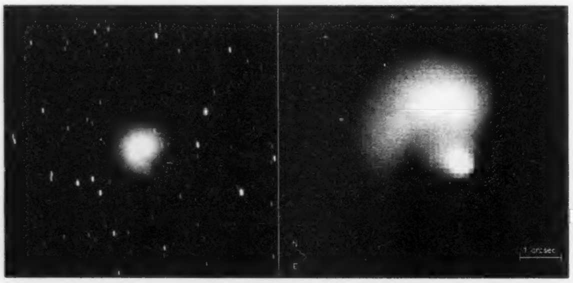


Photo A. *The HaleBopp comet as seen by the Hubble space telescope on September 26, 1995.*

Chuck was immediately and savagely attacked and denounced by astronomers everywhere, who claimed that the object in question was an 8.5 magnitude star, and the "line" was a diffraction spike caused by the optics in Shramek's telescope. The object in the photograph, however, was clearly brighter than magnitude 8.5, since it was at least as bright as the 4th magnitude Hale-Bopp... and Chuck's telescope does not have a secondary mirror support, and therefore does not create "diffraction spikes" on bright objects. Since that time, other photographs have surfaced from the Japanese National Observatory and others which also show a "companion" traveling with the Hale-Bopp comet.

If Hale-Bopp has a "companion," it would not be that unusual. Most objects in the solar system large enough to have any gravity at all have them. Even the tiny asteroid "Ida" has a companion, a small chunk of rock that orbits the asteroid (although why it was not named "Ho" is a great mystery!). Why, then, does the "Hale-Bopp companion" spark so much outrage and denial among astronomers?

Maybe it's the radio signals!

That's right, radio signals! Starting about the same time as Shramek's photo controversy, rumors of RF emissions

MFJ pocket size Morse Code Tutor

Learn Morse code fast, anywhere . . . LCD display lets you check your copy instantly . . . Easy no-code Beginner's Course . . .Takes you beyond Extra Class . . . Customized Practice . . . Plain English QSOs . . . Word Recognition Mode™ . . . Interactive Mode™ . . .

Learn Morse code anywhere, anytime with this tiny *MFJ Pocket Morse Code Tutor*™!

Take it everywhere! Enjoy code practice at home, going to work, on vacation, on a plane or in a hotel -- no matter where you are.

MFJ-418 gives you a large LCD display that reads out letters, numbers and punctuation in *plain English*. See code as it is being sent!

MFJ's proven *Beginner's Course* takes you from zero code speed to solid copy *fast!*

Realistic plain English QSO practice helps you pass your FCC code exam.

High-speed practice takes you to Extra Class and beyond . . .

Practice copying words as *one sound* -- not individual characters. Instant word recognition makes you a true, high-speed CW pro.

InstantReplay™ Check your copy *instantly*!

MFJ's interactive mode lets *you* set the pace -- *you* decide when to copy the next group and how many -- *not the tutor.*

Easy-to-use -- choose from menus on the LCD display -- no instruction manual needed!

Beginner's Course

QST rate MFJ tutors *"the clear choice for beginners"*. Follows ARRL/VEC format.

MFJ-418 takes you from knowing zero code to solid copy fast! You learn individual letter, number and prosign sets first. As you do, previously learned sets are combined with new sets to reinforce all that you have learned.

InstantReplay™

Practice copying and then replay to instantly check your copy on the LCD display.

Custom Character Sets

If you have trouble with certain characters, you can *build and save* a custom set of these for extra practice -- *an MFJ exclusive.*

Realistic Plain English QSOs

You can practice copying *realistic* on-the-air style plain English random QSOs.

They'll help get you ready for your FCC exam. When you're comfortable copying these QSOs, you're ready to pass and upgrade!

They'll also give you plenty of confidence before you make your first *real* contact.

MFJ's *CodeTest*™ set lets you practice *only* the characters required on FCC exams.

MFJ Word Recognition Mode™

MFJ's *Word Recognition Mode*™ gives you hundreds of commonly used words in amateur radio. Practice recognizing *entire words* instead of individual letters.

Learn to copy words without writing it down and carry on an entire CW conversation without paper -- just like pros on 40 Meter CW.

You can save 10 words of *your choice* for word recognition practice -- *an MFJ exclusive.*

You'll never run out of practice

Select letter, number, punctuation, prosign or code test sets, random call signs, random words, QSOs or combination sets for practice -- you'll never run out of study material.

You can even make up and save your own word and character sets for practice.

SET = CUSTOM
MFJ418MORSETUTOR

NEW!

MFJ-418
$79 95

MFJ InteractiveMode™

MFJ InteractiveMode™ lets *you* decide when to copy the next or previous group and how many -- great for beginners.

Normal or Farnsworth

Select normal or Farnsworth spacing.

Farnsworth makes it easier to recognize entire characters. It stops the tendency to count individual dots and dashes that slows learning.

Farnsworth character speed is adjustable 10 to 60 words-per-minute for high-speed practice.

Fixed or Random Length Groups

Use fixed length or more realistic random length groups. Up to 8 characters per group.

Change Speed on the Fly

Change speed on the fly while you're playing a session -- 3 to 55 words-per-minute.

No Instruction Manual needed!

Choose from easy-to-use menus on LCD display. Simple 3 button operation.

SettingSaver™

Your settings are *automatically* saved, ready to use next time -- no more #$%* resets!

Large LCD Display

Read words, letters, numbers and punctuations in *plain English* as code is being sent. It's a powerful sound and sight aid!

Check your copy, select from menus and program custom characters and words.

LCD has 2 lines and 32 *huge* 1/4" high-contrast characters.

SilkySmoothSidetone™

Only MFJ gives you *SilkySmooth Sidetone*™ with *TruTone*™ sinewave and *SoftStart*™ dots/dashes -- lets you concentrate on learning without the distraction of harsh keyclicks. Use earphones for private practice or built-in speaker for groups.

Adjustable volume. Loud, powerful audio amplifer. Variable pitch 300-1000Hz.

Pocket Size

Fits in shirt pocket with room to spare!

Smaller *than a pack of cigarettes* -- tiny 2 1/4x3 3/4x1 in., weighs less than 5 1/2 oz.

Toss it in your briefcase, travel bag or stash in your car's glove compartment and you'll always have it ready for instant practice.

Uses 9 volt battery. Not included.

Tapes Can't Compare

Tapes play the same old boring stuff over and over again. Unlike tapes, you'll never memorize the MFJ-418 random code sessions.

You'll pay more for a few sets of code tapes than an MFJ-418. The MFJ-418 is less expensive, lots of fun and *far* more effective.

More pocket size MFJ Morse Tutors

MFJ-417, $59.95. Random characters, words, QSOs. Selectable character sets. *CombineSet*™ Fixed or random length groups. Instant replay. Normal or Farnsworth. *3 to 35 WPM. Setting Saver*™. *SilkySmoothSidetone*™. Adjustable pitch 300 to 1000 Hz. Volume control. Use earphone for private practice. No LCD.

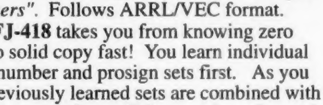
MFJ-413, $39.95. Similar to MFJ-417, less random words, QSOs, *SettingSaver*™.

MFJ-411, $69.95. Widely acclaimed original. Has most of the features of MFJ-418, no LCD.

Get Yours Today!

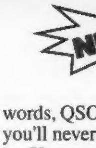
Enjoy more ham band privileges -- learn Morse code and upgrade! *Order yours today!*

MFJ Code Practice Oscillator


MFJ-557
$24 95

Learn to send Morse code with MFJ-557. Straight key with adjustable travel and tension, and built-in speaker with volume and tone controls lets you practice to your heart's content. Earphone jack. Heavy non-skid steel base stays put as you tap out Morse code. Use 9V battery or 110 VAC with MFJ-1305, $12.95. **MFJ-550, $7.95,** telegraph key only.

2 Meter *IntermodFighter™*

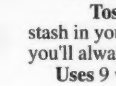

MFJ-713
MFJ-714
$59 95

Intermod causing squeaks, squawks, unidentified voices and other noises all across the 2 Meter band? Can't use your radio?

MFJ *IntermodFighter*™ eliminates intermod by reducing interference up to 50 dB with three high-Q bandpass filters. Plugs between radio and antenna.

MFJ-713, $59.95. For handhelds, has BNC connectors. Uses 9V battery. **MFJ-714, $59.95.** For mobile rigs, has SO-239 connectors. Uses 12VDC.

12/24 Hour Clock/ID Timer!



MFJ-116, $14.95. ID buzz every 10 minutes. Big 5/8" red LED digits. Loud/soft alarm. Uses 110 VAC. 9V battery backup. 4 1/2x2x4 inches.

Free MFJ Catalog
Nearest dealer/Free Catalog . . . 800-647-1800

http://www.mfjenterprises.com FAX: (601) 323-6551
•1 year unconditional warranty •30 day money back guarantee (less s/h) on orders from MFJ •**Add s/h**

MFJ
MFJ ENTERPRISES, INC.
P.O. Box 494, Miss. State, MS 39762
(601) 323-5869; 8-4:30 CST, Mon-Fri
Technical Help: (601) 323-0549

Prices and specifications subject to change. *©1996 MFJ Enterprises, Inc.*

MFJ . . . the world leader in ham radio accessories

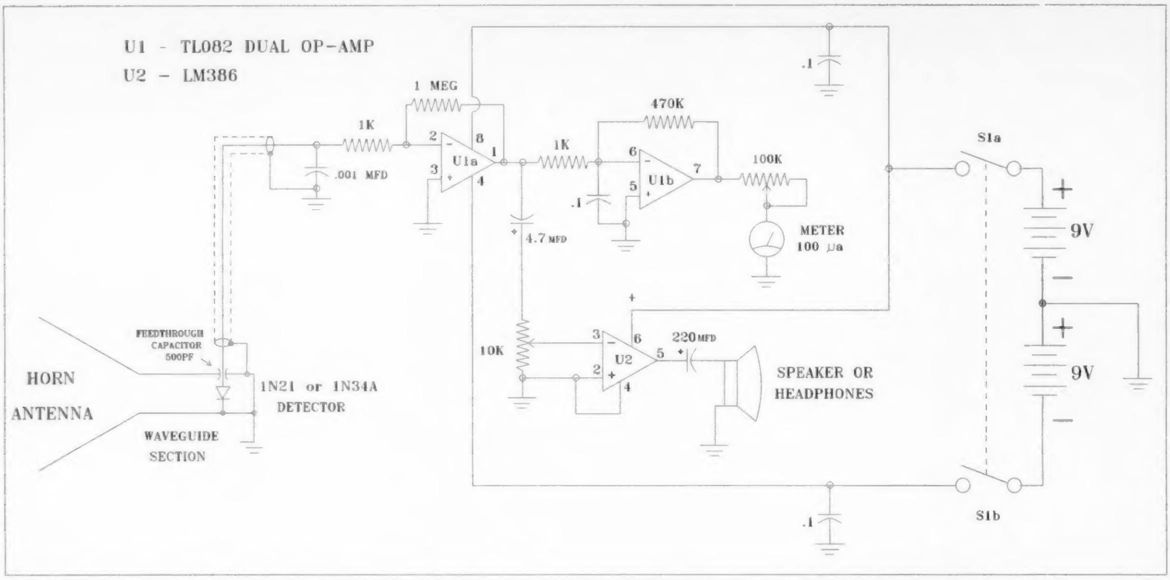

U1 - TL082 DUAL OP-AMP
U2 - LM386
1 MEG
1K
.001 MFD
U1a
470K
1K
U1b
100K
.1
4.7 MFD
METER
100 μa
10K
U2
220 MFD
SPEAKER OR HEADPHONES
S1a
9V
9V
S1b
.1
HORN ANTENNA
FEEDTHROUGH CAPACITOR 500PF
1N21 or 1N34A DETECTOR
WAVEGUIDE SECTION

***Fig. 1**. Schematic diagram for the Cosmic Crystal Set. A sensitive diode detects the microwave signals that enter the waveguide.*

from Hale-Bopp began to surface. Some of these emissions were broadband, clearly natural "noise," but others were reported as narrowband, high-intensity signals... *modulated* signals! Radio talk show host (and ham) Art Bell played a tape of one of these signals on the air, and added that a professional astronomer (who did not want his name mentioned) confirmed the reception of "unambiguous signals," not from the comet, but from the *companion!*

As you might expect, this announcement brought the controversy to a new level. Theories to explain the signals began to fly, ranging from some natural-but-unexplained byproduct of the intense gas jets to advanced extraterrestrial beings. Astronomers have refused to comment on the signals at all.

Friends, no professional scientist is going to touch this one, and we can't blame them. Scientists live in a political world, and their livelihoods depend on credibility—and funding. The mere mention of a phenomenon tainted with rumors of "giant spacecraft" and "little green men" assures that they will ignore it. It's a sad fact that, should some E.T. someday fly by and send us some sort of greeting in passing, we might never know, since the professionals would be too embarrassed to acknowledge it!

Hams, known to wear hats sprouting antennas, don't embarrass easily, so in this case it's clearly up to us. Best-selling author Whitley Strieber commented, on the Art Bell show, that hams should monitor Hale-Bopp for radio activity, just as amateur astronomers are observing it optically. I fully agree; whether there are E.T.s involved or not, Hale-Bopp is the most unusual visitor to the inner solar system in our lifetime, and won't return for 3,600 years. We won't get a second chance. Besides, it's a challenge right up our alley, and it sounds like fun!

The "Cosmic Crystal Set"

There has been very little technical information to go along with the Hale-Bopp signal rumors. There have been several references to "K-Band," which only narrows it down to 24 billion possible frequencies. We can, however, make some assumptions: *If* these signals are from intelligent beings, and *if* they are intended for us, then it's safe to assume that they will be easy to receive.

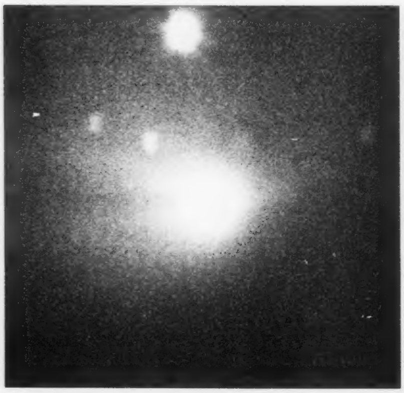


***Photo B**. Is this a hoax? This photo, from an anonymous source on the Internet, shows the Hale-Bopp comet with its purported companion.*

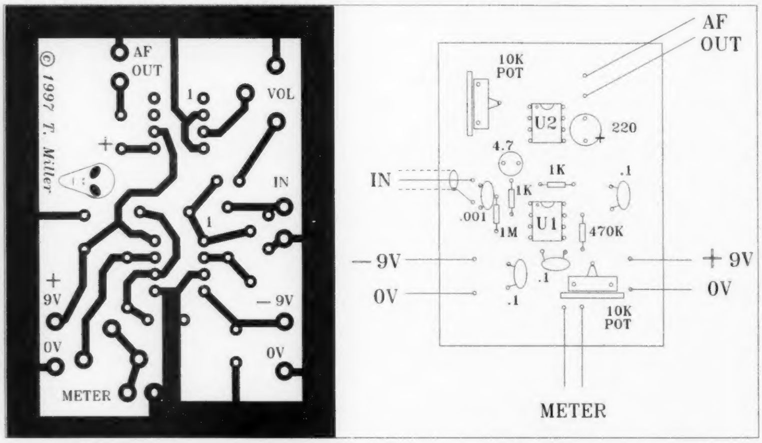

© 1997 T. Miller
AF OUT
1
VOL
IN
1
+ 9V
− 9V
0V
0V
METER
AF OUT
10K POT
U2
220
4.7
1K
1K
.1
IN
.001
1M
U1
470K
− 9V
+ 9V
0V
0V
.1
.1
10K POT
METER

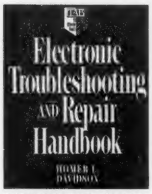
***Fig. 2**. Printed circuit board pattern and component layout guide for the Cosmic Crystal Set.*

Get 5 BOOKS FOR ONLY $4.95

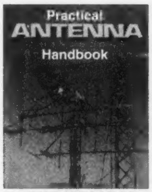
WHEN YOU JOIN THE **Electronics Book Club®**

VALUES TO $155.75

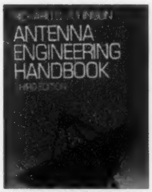
The leading source of information for electronics hobbyists for over 30 years!


Electronic Troubleshooting and Repair Handbook
Homer L. Davidson

015676X-XX $69.00
Counts as 2


Practical ANTENNA Handbook

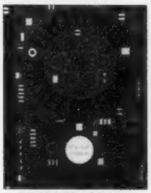
0111049 $49.95
Hardcover


ANTENNA ENGINEERING HANDBOOK
THIRD EDITION

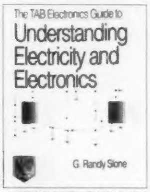
032381X-XXX $119.50
Hardcover/Counts as 3

3rd Edition
How to test almost everything electronic

0304068 $15.95



0487375 $24.95


The TAB Electronics Guide to Understanding Electricity and Electronics
G. Randy Slone

0582157 $26.95

TELEPHONE REPAIR ILLUSTRATED
STEPHEN J. BIGELOW

00523847 $28.95
Hardcover

SHORTWAVE Radio Listening for Beginners
Build your own SHORTWAVE ANTENNAS second edition
TUNING IN TO RF SCANNING FROM POLICE TO SATELLITE
The World Traveler's Guide SHORTWAVE LISTENING ON THE ROAD
THE COMPLETE SHORTWAVE LISTENING HANDBOOK FOURTH EDITION
THE BEGINNER'S HANDBOOK OF AMATEUR RADIO THIRD EDITION

0449902 $19.95
Hardcover

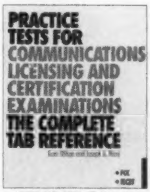
0765340 $16.95

0339635 $24.95
Hardcover

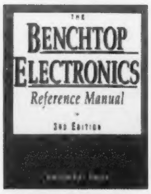
0047014 $19.95

076509X $17.95

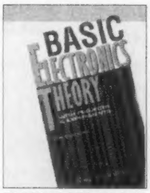
0365946-XX $22.95
Counts as 2


PRACTICE TESTS FOR COMMUNICATIONS LICENSING AND CERTIFICATION EXAMINATIONS
THE COMPLETE TAB REFERENCE

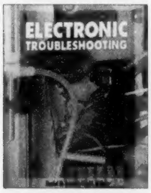
070824X $24.95


THE BENCHTOP ELECTRONICS Reference Manual
3RD EDITION

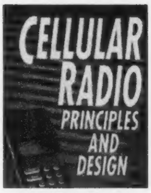
0673764-XX $54.95
Hardcover/Counts as 2


BASIC ELECTRONICS THEORY

0304084-XX $24.95
Counts as 2


ELECTRONIC TROUBLESHOOTING

0650780 $24.95


CELLULAR RADIO PRINCIPLES AND DESIGN

0443017 $50.00
Hardcover/Counts as 2

Basic Electronics Course
2nd Edition

1574875 $19.95

AMATEUR RADIO Encyclopedia

0235619-XXX $50.00
Hardcover/Counts as 3

Old Time RADIOS! RESTORATION and REPAIR
Joseph J. Carr

1557350 $18.95

RADIO RECEIVER PROJECTS

0156417 $21.95

If coupon is missing, write to: Electronics Book Club. *A Division of The McGraw-Hill Companies*, P.O. Box 549, Blacklick, OH 43004-9918

As a member of the ELECTRONICS BOOK CLUB... you'll enjoy receiving Club bulletins every 3-4 weeks containing exciting offers on the latest books in the field at savings of up to 50% off the regular publishers' prices. If you want the Main selection, do nothing and it will be shipped automatically. If you want another book, or no books at all, simply return the reply form to us by the date specified. You'll have at least 10 days to decide. If you ever receive a book you don't want due to late delivery of the bulletin, you can return it at our expense. Your only obligation is to purchase 3 more books during the next 12 months, after which you may cancel your membership at any time. And you'll be eligible for FREE BOOKS through our Bonus Book Program.

☎ **PHONE: 1-614-759-3666**
(8:30 a.m. to 5:00 p.m. EST Monday-Friday)

FAX:1-614-759-3749
(24 hours a day, 7 days a week)

Electronics Book Club®

A Division of The McGraw-Hill Companies, P.O. Box 549, Blacklick, OH 43004-9918

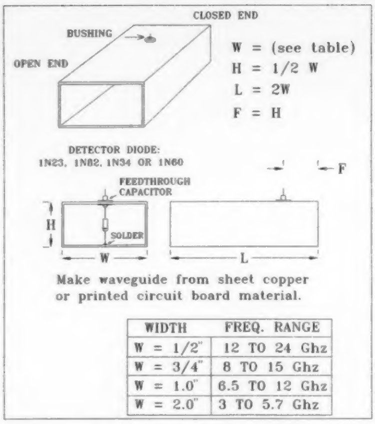
☐**YES!** Please send me the books listed below, billing me just $4.95, plus shipping/handling & tax. Enroll me as a member of the Electronics Book Club according to the terms outlined in this ad. If not satisfied, I may return the books without obligation and have my membership cancelled.

If you select a book that counts as 2 choices, write the book number in one box and XX in the next.
If you select a book that counts as 3 choices, write the book number in one box and XXX in the next two boxes.

Name____________________
Address/Apt. #____________________
City/State____________________
Zip__________ Phone____________________

Valid for new members only, subject to acceptance by EBC. Canada must remit in U.S. funds drawn on U.S. banks. Applicant outside the U.S. and Canada will receive special ordering instructions. A shipping/handling charge & sales tax will be added to all orders.
STAR497

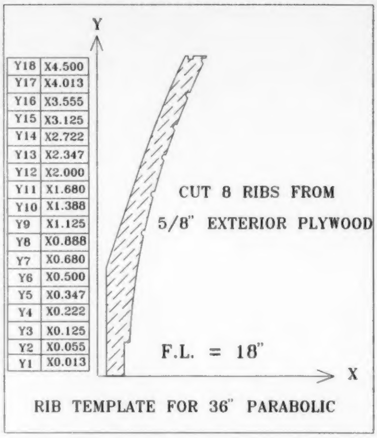
A shipping/handling charge and sales tax will be added to all orders. All books are softcover unless otherwise noted. (Publishers' Prices Shown) © 1997 EBC


CLOSED END
BUSHING
OPEN END
W = (see table)
H = 1/2 W
L = 2W
F = H
DETECTOR DIODE:
1N23, 1N82, 1N34 OR 1N60
FEEDTHROUGH CAPACITOR
SOLDER
H
W
L
F
Make waveguide from sheet copper or printed circuit board material.

WIDTH	FREQ. RANGE
W = 1/2"	12 TO 24 Ghz
W = 3/4"	8 TO 15 Ghz
W = 1.0"	6.5 TO 12 Ghz
W = 2.0"	3 TO 5.7 Ghz

***Fig. 3.** Waveguide and crystal diode detector construction details.*

They would also probably utilize microwave frequencies where antennas behave much like optics, making efficient, tightly focused transmissions possible. Given that, K-Band doesn't sound like a bad choice, but there's no reason not to listen to the entire microwave spectrum, and perhaps UHF and VHF as well. A voltage-tuned TV tuner can sweep from 54 to 800 MHz, and, with the IF displayed on an oscilloscope, makes a sensitive spectrum analyzer. TVRO systems could be used, using the baseband video output to drive a good HF receiver. Surplus radar detectors have sensitive superhet front ends for both X- and K-Band. All these things can, and should, be used—but what if you don't have access to any equipment at all? No problem. You *build* something!


Y
X
CUT 8 RIBS FROM
5/8" EXTERIOR PLYWOOD
F.L. = 18"
RIB TEMPLATE FOR 36" PARABOLIC

Y18	X4.500
Y17	X4.013
Y16	X3.555
Y15	X3.125
Y14	X2.722
Y13	X2.347
Y12	X2.000
Y11	X1.680
Y10	X1.388
Y9	X1.125
Y8	X0.888
Y7	X0.680
Y6	X0.500
Y5	X0.347
Y4	X0.222
Y3	X0.125
Y2	X0.055
Y1	X0.013

***Fig. 4.** Rib pattern for the three-foot-diameter parabolic dish. The focal length is 18 inches.*

Fig. 1 shows the schematic diagram of the "Cosmic Crystal Set." This simple microwave receiver is nothing more than a sensitive germanium diode detector in a short section of rectangular waveguide. The diode rectifies the microwave energy which is bypassed for RF by a small ceramic feedthrough capacitor. The resultant DC (and audio, if the signal is modulated) is passed to the input of the amplifier.

The amplifier uses a TL082 dual op-amp for two stages of DC-coupled gain. The first stage amplifies the incoming signal, and the second serves as a meter driver. The 100-microamp meter provides an indication of signal strength. If you use a zero-center meter, it won't matter which way you connect the diode across the waveguide.

A 4.7-microfarad capacitor is used to pick off any audio present on the signal, where it is boosted by an LM386 audio amplifier. It can drive headphones or a small speaker. The circuit is powered by two 9-volt batteries.

Fig. 2 shows the printed circuit board and parts layout for the amplifier. The parts are available from Radio Shack™, as well as any good electronic supply house. If there is any interest, I can provide circuit boards for those who can't make their own.

When completed, this device is actually a very sensitive field-strength meter. The only frequency-selective component is the waveguide itself. **Fig. 3** shows the construction of the waveguide, which can be made from sheet brass, copper, or tin. Printed circuit board material works well, also.

A waveguide is actually a high-pass filter. The cutoff is the point where the wavelength is equal to the width of the guide. Waves shorter than half the guide's width will pass through as well, but the mode of propagation is uncertain, so waveguides are selected in different widths for various bands of frequencies. The table at the bottom of **Fig. 3** shows the proper waveguide width for the different microwave bands. All other dimensions are scaled to this width, as shown. By building one amplifier and a number of waveguide/detectors, it is possible to monitor virtually the entire microwave spectrum.

These waveguides will receive signals of only one polarization, so some method of rotating the horn 90 degrees should be employed to catch both horizontal and vertical signals.

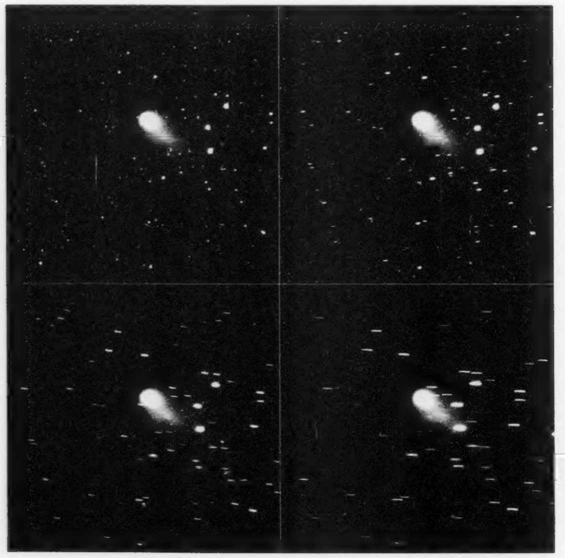


***Photo C.** The Hubble telescope captures the Hale-Bopp as it hurtles toward our solar system.*

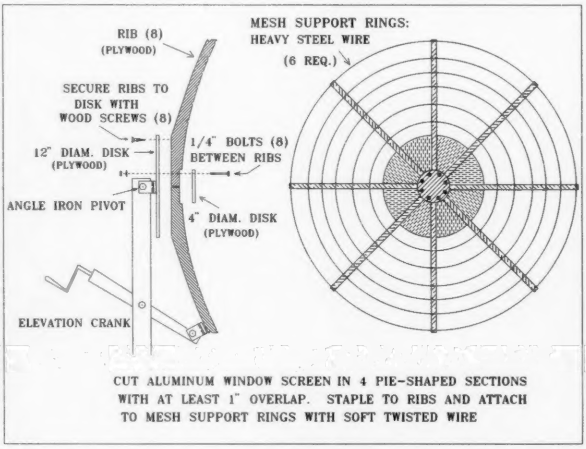

RIB (8) (PLYWOOD)
MESH SUPPORT RINGS: HEAVY STEEL WIRE (6 REQ.)
SECURE RIBS TO DISK WITH WOOD SCREWS (8)
12" DIAM. DISK (PLYWOOD)
1/4" BOLTS (8) BETWEEN RIBS
ANGLE IRON PIVOT
4" DIAM. DISK (PLYWOOD)
ELEVATION CRANK
CUT ALUMINUM WINDOW SCREEN IN 4 PIE-SHAPED SECTIONS WITH AT LEAST 1" OVERLAP. STAPLE TO RIBS AND ATTACH TO MESH SUPPORT RINGS WITH SOFT TWISTED WIRE

***Fig. 5.** Construction details of the three-foot dish. The framework is covered with aluminum window screen.*

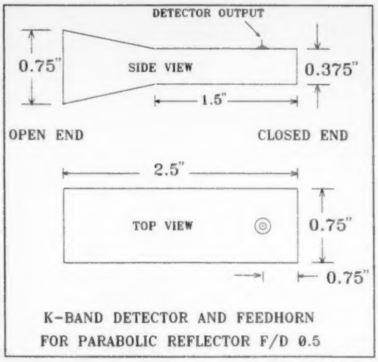


***Fig. 6.** Dimensions for the K-Band detector and feedhorn. This feed will work with other dishes with a focal ratio of 0.5 to 0.7.*

Home-brew microwave antennas

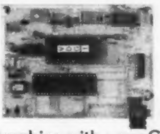
Since diodes have loss, we have to offset this with antenna gain. The most popular microwave antenna is the parabolic reflector. A dish in the 2- to 4-foot range should be ideal for K-Band signals; anything larger would have too narrow a beamwidth to be of much use. **Fig. 4** shows a rib template for a 3-foot parabolic reflector with a focal distance of 18 inches. You can scale this drawing up directly, or lay out your own pattern by plotting the X and Y coordinates from the table and connecting the dots.

Fig. 5 shows how the ribs are assembled to form the antenna framework. The ribs are mounted on a 12-inch plywood disk, while a 4-inch disk is mounted in front. Through-bolts hold the two disks together, providing a strong support for the ribs. I've used this technique for quite a number of antennas, the largest measuring 12 feet.

The feedhorn is shown in **Fig. 6**. Essentially the same as the waveguide/detector shown in **Fig. 3**, the waveguide is extended an inch, while the narrow dimension is flared to match the 3/4-inch width, providing a square aperture. The diode is mounted half a guidewidth from the shorted end. The dimensions shown are for K-Band signals, but can be scaled for other bands.

Sometimes surplus dishes turn up surprisingly cheap, and most often the focal distance of these dishes is very short, making them hard to feed with a conventional horn. **Fig. 7** shows a simple way around this problem: Rather than flaring the waveguide into a horn, the corners of the open end are trimmed back at an angle and a "dispersal pin" is added in

VIDEO I.D. BOARD
•Custom Graphics with your Call Sign
•4 Screens (2 Hi-res/2 color bar)
•12 VDC Operation
•Instant Video ID
•Video Relay for switching in Live Camera Video
•Built-in Automatic Sequencer-Timer (steps through all four screens)
VDG-1 with pre-programmed calls:
$99
Call or write for catalog of available graphics
ELKTRONICS
12536 T.R. 77 • Findlay, OH 45840
(419) 422-8206



WANT TO LEARN CODE?
Morse Tutor Gold from G.G.T.E. is the answer for beginners and experts alike.
*Get the software the ARRL sells and uses to create practice and test tapes; and Morse Tutor Gold is approved for VE exams at all levels.
*Since 1987, GGTE has guided nearly 20,000 hams and prospective hams around the world through proven structured lessons and a variety of character, word and conversation drills. Straight forward menus make the process simple and fun.
*This program features easy and speedy self installation; random character drills with the characters you select; and you can create your own drills or import text files. You can type what you hear or copy by hand and see the results one line at a time. Pick the Farnsworth or the standard method; select the tone frequency most comfortable for you or select your code speed in tenths of a word per minute. For all DOS computers. You are always in command.
Certified by Sound Blaster
Morse Tutor Gold uses your internal speaker or sound board. And, if you use a sound board Morse Tutor Gold supports volume control.
Sound Blaster and the Sound Blaster Compatibility Logo are trademarks of Creative Technology Ltd.
Available thru dealers, the ARRL, or send $29.95 + $4 S&H (CA residents add $2.32 tax) to: GGTE, P.O. Box 3405, Dept. MS, Newport Beach, CA 92659 Specify 5 1/4 or 3 1/2 inch disk.
CIRCLE 193 ON READER SERVICE CARD

160-10 G5RV QuicKits™
created by AntennasWest Box 50062-S, Provo, UT 84605
Fast & Easy to Build
• Fail-Safe visual instructions
• No measuring or cutting
• Everything included
• Finish antenna in minutes
Quality Components
• Presoldered Silver Fittings
• Kinkproof QuietFlex wire
• Fully insulated, wx sealed, no-corrode, low noise design
Tune All Bands incl WARC
• Double Size G5RV 204 ft 160-10 Dipole $59.95
• Full Size G5RV 102 ft 80-10 Dipole $39.95
• Half Size G5RV 51 ft 40-10 Dipole $29.95
• Quarter Size G5RV 26 ft 20-10 Dipole $24.95
• ReadyMade 102 ft G5RV $50.00
• ReadyMade 51 ft G5RV/2 $40.00
• 200' Dacron 250# line $11.95
Add $5 P&H
Want Plans, Patterns, Data? Order TechNote #124-D $6.95 ppd USA
Order Hot-Line: 1-800-926-7373
CIRCLE 116 ON READER SERVICE CARD

Measure Up With Coaxial Dynamics Model 81000A RF Directional Wattmeter
Model 81000A is a thoroughly engineered, portable, insertion type wattmeter designed to measure both FWD/RFL C. W. power in Coaxial transmission lines. 81000A is comprised of a built-in line section, direct reading 3-scale meter protected by a shock-proof housing. Quick-match connectors, plus a complete selection of plug-in elements, gives the FRONT RUNNER reliability, durability, flexibility and adaptability with a two year warranty.
Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.
COAXIAL DYNAMICS, INC.
15210 Industrial Parkway
Cleveland, Ohio 44135
216-267-2233
1-800-COAXIAL
FAX: 216-267-3142
See Us At Dayton – Booths 401 & 402
Service and Dependability...A Part of Every Product
E-Mail coaxial@apk.net http://www.coaxial.com
CIRCLE 186 ON READER SERVICE CARD

COAXIAL DYNAMICS, INC. CLEVELAND, OHIO U.S.A.
R.F. WATTMETER

Littlite ®
Gooseneck Lamps and Accessories

$ 59.95
Includes shipping & Handling

Performs with consistent reliability providing dimmer controlled illumination for late night DX'ing.

- Bright, 5 Watt Halogen Bulb
- Dimmer Controlled
- 12" and 18" Lengths
- Slot for Color Filter
- 12 Volt Operation, AC or DC
- Mounting Accessory Options

Credit Card Customers can order by phone.
PH 810-231-9546 EXT 202 or
FAX 810-231-1631

Send to:
Littlite/CAE, Inc.
P.O. Box 430
Hamburg, MI 48139-0430 USA

☐ My check or money order is enclosed.

Charge: VISA or Mastercard
Account No ______________
Expiration Date ______________
Please Print Clearly
Name ______________
Address ______________
City ______________
State ________ Zip ______________
Phone ______________
Sign Here ______________

CIRCLE 150 ON READER SERVICE CARD

the center of the opening. I've used this to feed dishes with F/D ratios as small as .25 with great success. The beamwidth will vary somewhat with the angle, but 20 degrees seems to work pretty well. For K-Band, a piece of 14-gauge wire will work for the dispersal pin; make it thicker at lower frequencies.

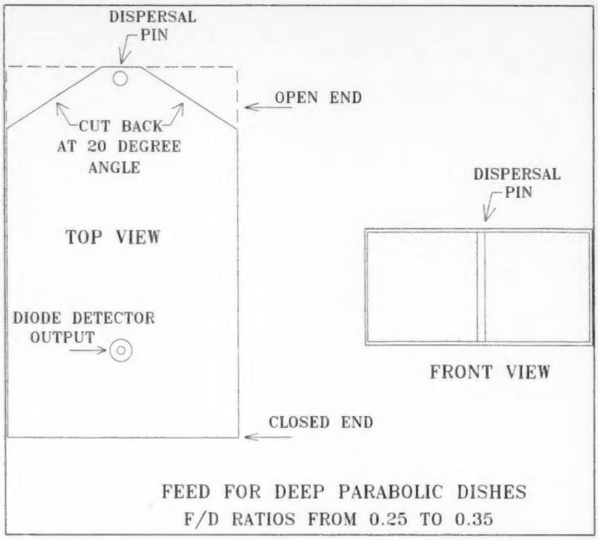

DISPERSAL PIN
OPEN END
CUT BACK AT 20 DEGREE ANGLE
TOP VIEW
DIODE DETECTOR OUTPUT
CLOSED END
DISPERSAL PIN
FRONT VIEW
FEED FOR DEEP PARABOLIC DISHES
F/D RATIOS FROM 0.25 TO 0.35

Fig. 7. By trimming the open end of the waveguide as shown, short-focal-length surplus dishes can be easily fed.

All right, you don't have a parabolic lying around, and building one takes too long. Now what do we do? **Fig. 8** shows a simple alternative that anyone can make with a yardstick and a pocketknife. It's a "Giant Pyramidal Horn" antenna, and it can be made from aluminum-foil-backed Styrofoam™, available in standard (4- x 8-foot) sheets at any lumberyard or building supply store. In essence, the horn has as much gain as a dish of the same area, so the 12-inch by 14-inch horn shown might be the equivalent to an 18-inch dish. There is no reason, however, why it cannot be made much larger: Just taper the open end smoothly to whatever size waveguide you are using. The foam can be glued with white carpenter's glue and reinforced with toothpicks. The inside corners can be covered with aluminum tape.

Well, there you have it... simple microwave equipment that you can build tonight, and listen to Hale-Bopp on tomorrow! If you hear anything, send me your reports and I'll post them on my web site, The Martian Archives. If you have Internet access (and you should!), you can keep an eye on this site to see what others are hearing. The URL is: http://www.infocom.com/~thomil/

Afterword

Okay, so you built the Cosmic Crystal Set, and Hale-Bopp came and went with nary a sign of Extraterrestrial Biological Entities. Now what?

Well, you might as well keep listening. After all, there are countless microwave signals of all types within reach of the amateur, and no doubt

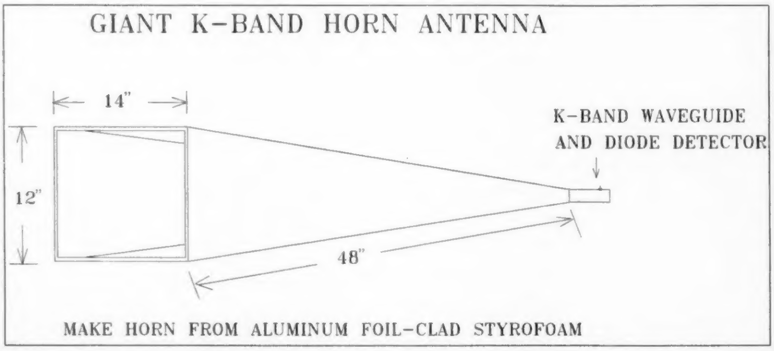

GIANT K-BAND HORN ANTENNA
14"
12"
48"
K-BAND WAVEGUIDE AND DIODE DETECTOR
MAKE HORN FROM ALUMINUM FOIL-CLAD STYROFOAM

Fig. 8. The giant pyramidal horn is more bulky than a parabolic reflector, but is far less critical and easier to build.

certain people wouldn't enjoy knowing that you are listening to them. What better reason is there for listening? Also, you now have a very sensitive field strength meter—connect a diode across a two-meter dipole and it should make a good sniffer for transmitter hunts. Or, you could connect the coil of an old relay to the input, making a very sensitive magnetic field monitor.

And if the E.T.s didn't send you their greetings *this* time, who knows what will show up tomorrow?

I welcome your comments... send E-mail to thomil@infocom.com. Should you prefer to correspond via disgruntled government employees, please include an SASE.

Internet resources: the World Wide Web

http://www.infocom.com/~thomil/ —"The Martian Archives"—This is the author's home page. There is an area devoted to the Hale-Bopp monitoring project.

http://www.stsci.edu/pubinfo/pictures.html —This is the home page of the Hubble Space Telescope. There are Hale-Bopp images here, but nothing new has been posted since early November.

http://newproducts.jpl.nasa.gov/comet/ —NASA's "Hale-Bopp Home Page." Keep in mind that this is from the guys at Never Actually Say Anything... and this is probably the *slowest* web server in the universe.

http://www.neosoft.com/~cshramek/ —Home page of Chuck Shramek, who started all the controversy by imaging the "companion."

http://www.strieber.com —Whitley Strieber has devoted an area to late-breaking comet news. Whitley first mentioned using amateur radio operators to monitor Hale-Bopp.

http://www.artbell.com —Home page of Art Bell, amateur radio operator and late-night radio host. Art has a lot of comet information on-line, as well as many other interesting topics.

BROADCAST TRANSMITTER
The **FMS2** studio quality transmitter is FULLY crystal controlled and programmable to any FM broadcast frequency.
Unit features: ALC, 2:1 compressor, audio buffer / amplifier, pre-emphasis, roll off filter, stereo generator, digital PLL tuning, 75 MHz-125MHz bandwidth, 500mW power output and a special introductory price of only $295.00 US.
SCHEMATICS FOR UNIT $27 CATALOG 800-504-1178
FAX POLL INFO 416-243-1067 TEK LINE 416-243-2260
wavemach
CIRCLE 245 ON READER SERVICE CARD

Where's the Fun?
The 10 meter test had started, and I expected the band to open about the time I arrived at the motel. Rig and gel cell were in the trunk, Maxi-J was right beside. rolled up inside the launcher pail. Room with a view. Maxi takes off from the balcony sloping down to a tree. His tail slips under the door. And I'm 59 in Japan.
J-10 $39 J-15 $42 J-17 $47 J-20 $49 J-30 $59 J-40 $69 Info Pack $1
Add $6 Post & Handling USA & Canada $14 others
AntennasWest
Box 50062-S, Provo UT 84605
Order Hotline: 800-926-7373
CIRCLE 132 ON READER SERVICE CARD

See the FUN you've been missing!

Slow Scan TV
Every day more and more hams are enhancing their enjoyment of ham radio by adding images to their conversations. Join the fun!
new ***Pasokon TV*** Lite . . . . $30 + $3 shipping.
Pasokon TV Classic . . . . $200 + $5 shipping.
Absolute Value Systems
115 Stedman St. #7
Chelmsford, MA 01824-1823
(508) 250 0611
http://www.ultranet.com/~sstv
CIRCLE 351 ON READER SERVICE CARD

WE SHIP WORLDWIDE
Barry Electronics Corp.
WORLD WIDE AMATEUR RADIO SINCE 1950
Your one source for all Radio Equipment!
For the best buys in town call:
1-800-990-2929
Los Precios Mas Bajos en Nueva York
WE SHIP WORLDWIDE!
Export orders expedited.
Special export prices.
KITTY SAYS: WE ARE OPEN 7 DAYS A WEEK
•Sat. 10-5 •Sun. 12:30-6 •M-F 9-6 *Come to Barry's for the best buys in town.*
MOTOROLA SP10, SP50, P110, GP300, GP350, M120. GM300, GR300 repeaters, & SM50

WHEREVER I GO, I TAKE MY RADIO.
SPECIALIST IN RADIOS:
•BUSINESS •MARINE
•AVIATION •HAM RADIOS
•SCANNERS
Radios for Business, Governments, Consulets, Embassies. Stocked and Serviced. Overseas and Domestic Orders.
ICOM
HAM, MARINE, BUSINESS AND AVIATION RADIOS
281-H, 2000-H, 2350-H, A-22,IC-77, IC-706, IC-707.
NEW F30LT/F40LT, V100
"YAESU HAM & VERTEX BUSINESS RADIOS" FT51-R, FT-8500. FT-10, FT-11, FT-2500, FT-3000, FRG-100B, FT-1000D, FT-50R, FT-5200, FT-840, FT-900AT, FRG-100, VXR-5000 repeater 25 watts, VHF or UHF. Marine Mobile VXM-100.
KENWOOD
Shortwave Receivers R-10, R-100, R-7000, R-8500, R-9000, GP-22A
NEW — 220 MHz BUSINESS RADIOS WITH REPEATERS
Business Radios: Motorola, ICOM, Maxon, Yaesu, FTH 2008/7008, etc, Uniden, Regency, Reim
Marine ICOM: M10A, mii, etc.
Aviation ICOM: A22, A200
"TS-50S." TS-570, R-5000, TS-850S, TM 241/A441A, TM-V7A, TM-942A, TR-751A, Kenwood Service Repair, TS140S, TS690S, RZ-1, TS-790A, TS950SD,TH 79A(D), TH28/48A, TM-741A, TM-733A, TM-641A, TM-742A.
•Cellular Phones •Shortwave Radios •Scanners •Best Prices
MOTOROLA RADIOS EXPORT & DOMESTIC CALL FOR PRICES
Electron Tubes 3-500z, 572B, 6JS6C, 12BY7A, & 6146B
FT-50R Yaesu
MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800, AVIATION PORTABLE ICOM A22, MOTOROLA, TRITON MARINE
TH-79A(D) Kenwood FT-51R Yaesu
Save money on batteries. Call for Special Prices.
Surveillance Devices Available
SHORTWAVE RECEIVERS STOCKED
Barry's supplies all MFJ products Call us direct.
Wide selection of SW & Amateur Publications
Shortwave Receivers & Radios
Drake • Grundig • JRC • Sony
Sangean • Panasonic • Yaesu
ICOM • Lowe • Kenwood
Computer Interfaces Stocked: MFJ-1270B, MFJ-1274, MFJ-1224, AEA PK-88, MFJ-1278T, PK-900, PK-232 DSP W/FAX, DRSI PRODUCTS DSP 2232
Antenna Tuners: MFJ, AEA AT-300, ICOM, KENWOOD, YAESU, VERTEX
COMMERCIAL & HAM REPEATERS STOCKED. WRITE FOR QUOTES
KANTRONICS KAM PLUS Etc.
2 Meter, 440, 220MHz Band-Pass Filters from DCI
CB Radios Stocked
148GTL, Washington, Ranger 2950-70,
Antennas: Wilson, Antron, etc.
Power mikes w/beeps -
ECHO - SilverEagle etc.
MOTOROLA AUTHORIZED DEALER
KACHINA COMMUNICATIONS DEALER
AUTHORIZED DEALER
SONY
Shortwave Radios Stocked
Amplifiers- Icom, Kenwood, Yaesu, RF concepts, Mirage, TE Systems, HF/VHF/UHF, AMERITRON, etc.
ALINCO DJ-180, DJ-G5TY, etc.
BIRD Wattmeters & Elements in Stock
Telephone Autopatch
Telephone Scramblers
Hy-Gain Towers
Overseas Telephone Systems for Rural Areas
ANTENNAS: A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Urban, MODUBLOX, TONNA, Butternut, Multi-Band, Alpha Delta, ANLI, Antenna Specialist, Barker & Williamson, Comet, Diamond, GAP, Laresen, Etc. Watt-Meters Stocked.
BENCHER PADDLES BALUNS LOW PASS FILTERS IN STOCK
Fm & AM Broadcast Transmitters Stocked
Satellite Phones
Garmin & Magellan Global Positioning Systems
ASTRON POWER SUPPLES
Belden Wire & Cable, Int'l Wire
BARRY ELECTRONICS CORP., 540 BROADWAY, NY, NY 10012 (Five blocks N. of Canal St., between Spring & Prince St.) FAX 212-925-7001 Phone 212-925-7000
New York City's LARGEST STOCKING TWO WAY RADIO DEALER COMPLETE REPAIR LAB ON PREMISES
"Aqui Se Habla Espanol"
BARRY INTERNATIONAL
FAX 212-925-7001 Phone 212-925-7000
For Orders Call 1-800-990-2929
Monday-Friday 9 AM to 6 PM
Saturday 10-6 PM / Sunday 12:30-6
Subways: #6 Spring St. stop, N. or R. train to Prince St. stop F train to Houston St. stop
Bus: Broadway bus to Prince St. stop, Path train to 9th St./6th Ave.
COMMERCIAL RADIOS STOCKED: •MOTOROLA •ICOM •MAXON •STANDARD, •YAESU •RELM etc.. We serve municipalities, businesses, Civil Defense, etc. Portables, mobiles, bases, repeaters...
We stock: AEA, Alinco, Ameco, Ameritron, Antenna Specialist, ARRL, Astatic, Astron, B&K, Belden, Bencher, Bird, Butternut, CES, Cushcraft, Codan, Daiwa, Eimac, Henry Heil, Hustler, Hy-Gain, Icom, KLM, Kantronics, Kenwood, Larsen, Maxon, MFJ, Mirage, Motorola, Nye, Palomar, RF Products, Shure, Standard, TUBES & Tube Cartons, Uniden, Yaesu, Vibroplex, Duplexers, Repeaters, Scanners, Radio
WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS
DEALER INQUIRIES INVITED PHONE IN ORDER & BE REIMBURSED
COMMERCIAL RADIOS STOCKED & SERVICE ON PREMISES.
EXPORT orders shipped immediately. CALL
SALES FINAL
Technical help offered upon purchase
FAX: 212-925-7001
CIRCLE 41 ON READER SERVICE CARD

TV/VCR Tuner Applications

The first of a three-part series.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266-4025

With the increased availability of used TV/VCR tuners, electronic projects abound for the ham experimenter. Numerous receiver and test equipment projects can be developed around TV/VCR tuners, which are the RF front ends of TV receivers and VCRs. Modern tuners are electronically tuned, which makes them mechanically stable and relatively easy to use. "Cable ready" tuners have a typical frequency range from about 45 to 900 MHz, which covers most of the desired VHF and UHF spectrum.

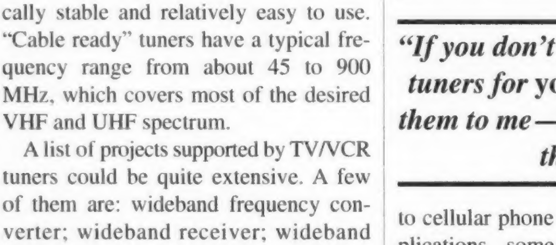
A list of projects supported by TV/VCR tuners could be quite extensive. A few of them are: wideband frequency converter; wideband receiver; wideband signal generator; sweep generator; standard deviation signal source; spectrum analyzer; and tracking generator. Here's a little more insight into each project.

Wideband frequency converter and receiver

These two projects are closely related in that the tuner performs the same function for each, but a different receiver is used after the tuner. Not all tuners are alike, nor do they cover exactly the same band of frequencies, but they do provide the capability of receiving a band of frequencies ranging from about 45 to 900 MHz. This band of frequencies is the typical frequency range covered by TV channels 2 through 83. Although the upper three channels have been transferred to cellular phone and other business applications, some tuners may still approach 900 MHz. There will be little loss in tuner desirability due to the band change, however.

> ***"If you don't plan to save your tuners for your projects, give them to me—I'll find a use for them!"***

The basic difference between the converter and receiver applications deals with the receiver used following the tuner. A converter is a stand-alone box which outputs a single frequency (47-63 MHz) to a receiver where the rest of the receiver functions are supported. The 47-63 MHz output is referred to as the intermediate frequency (IF) of the tuner. The tuner and receiver functions are contained within one box to provide a complete wideband receiver.



PIN	FUNCTION
1	IF
2	PLL +5 V
3	BM +12 V MIXER
4	N/C
5	BH VHF HIGH
6	BL VHF LOW
7	AGC 0 - 7 V
8	BS SUPER BAND
9	VT TUNING VOLTAGE 0 - 29 V
10	BU UHF BAND

***Fig.1.** Typical connector configuration.*

Signal generator

Within every TV/VCR tuner is a local oscillator which is intended to mix with a received signal to produce an IF. The oscillator operates typically on the high side of the received signal and is offset in frequency by the value of the IF. Normally, the oscillator signal can be accessed and used as a signal source with the support of tuning control and power. Thus a signal generator is born capable of covering the band from 90 to 915 MHz.

Sweep generator

A sweep generator is used to sweep a frequency across a resonant device or circuit with the objective of observing the profile of the circuit's response as a function of frequency.

With the oscillator in a tuner being used as a signal generator, a sawtooth voltage waveform is applied to the tuning voltage line, causing the oscillator to sweep across a band of frequencies. The frequency spread is controlled by the amplitude of the sawtooth, while the sweep rate is controlled by the repetition frequency of the sawtooth.

Standard deviation signal source

When a signal is frequency modulated with a sine wave audio signal, the produced carrier from the generator will

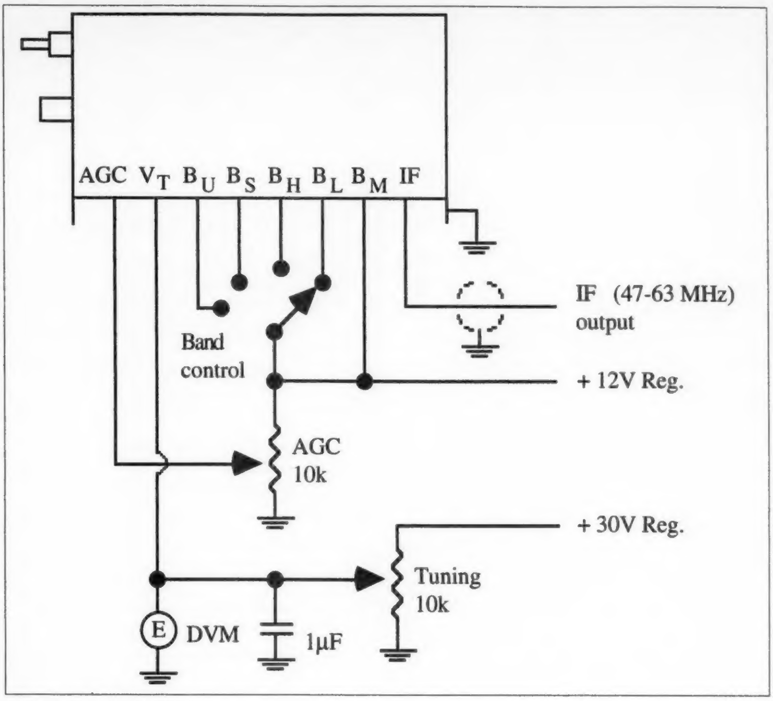


***Fig. 2.** Test circuit.*

null in exact correlation with the amount of frequency deviation. The audio signal as modulation is applied to the tuning voltage line FMing the carrier. The amount of deviation is controlled by the amplitude of the sine wave modulation. With the use of a Bessel Function chart or a carrier null equation, the carrier null can be predicted for accurate frequency deviation measurements or as a standard deviated signal source.

Spectrum analyzer

A spectrum analyzer utilizes the sweep function of the sweep generator, but functions as a receiver. The output of the spectrum analyzer is displayed on an oscilloscope. Adjusting the sweep width allows viewing of a selected portion of frequency spectrum. One of the many uses of the spectrum analyzer is to allow the examination for purity of a transmitted signal. If the transmitted signal is "dirty," numerous spurious signals will be observed within the transmitted spectrum and centered on the signal.

VT	BL	BH	BS	BU
0	45	82	156	406
5	71	139	214	539
10	92	160	269	646
15	106	180	320	762
20	114	200	357	850
25	118	205	370	899
28	119	207	376	915

***Table 1.** Typical frequencies vs. voltage table.*

Tracking generator

A tracking generator utilizes the sweep generator function and is used in conjunction with the spectrum analyzer to profile the frequency response of a resonant circuit. In operation, the tracking generator operates precisely on the received center frequency of the spectrum analyzer and remains in sync as it is swept across any selected portion of spectrum.

ID your tuner

Building a receiver is generally a pretty complex project, but with TV/VCR tuners available from junked equipment, the complexity is cut to less than half—making the building of a receiver feasible. Let me make you a

ALL ELECTRONICS
CORPORATION

HARD SHELL TRANSIT CASE (USED)

Heavy-duty, impact resistant plastic transit case with aluminum hinges and trim and metal clasps. Black crinkle exterior and black carrying handle. These cases were used slightly for moving medical equipment. They are in excellent condition. Exterior dimensions: 18.5" X 14" X 7.5"

CAT # CSE-9 $19.50 each

410 UF, 300 VOLT PHOTOFLASH CAPACITOR

Rubycon # 1A2304A 0.7" diameter X 1.7" long. Right angle PC or solder-leads on 0.25" centers.

CAT# PPC-410

$2.00 each

10 for $18.50
200 for $320.00

AUTOMOBILE VOLTAGE CONVERTER

Run audio, communications and other battery operated devices from your car cigarette lighter. Regulated DC-DC converter supplies selectable voltages from 1.5 Vdc to 12 Vdc at up to 800 milliamps. Adjustable polarity. Includes six different adapter plugs that fit most equipment.

CAT # APC-800 $4.00 each

ORDER TOLL FREE
1-800-826-5432
CHARGE ORDERS to Visa, Mastercard, American Express or Discover

TERMS: *NO MINIMUM ORDER.* Shipping and handling for the 48 continental U.S.A. $5.00 per order. All others including AK, HI, PR or Canada must pay full shipping. All orders delivered in CALIFORNIA must include local state sales tax. Quantities Limited. NO COD. Prices subject to change without notice.

CALL, WRITE FAX or E-MAIL for our FREE 96 Page CATALOG
Outside the U.S.A. send $2.00 postage.

MAIL ORDERS TO:
ALL ELECTRONICS CORPORATION
P.O. Box 567
Van Nuys, CA 91408
FAX (818)781-2653
E-Mail allcorp@allcorp.com
Internet - http://www.allcorp.com/

proposition: If you don't plan to save your tuners for *your* projects, please give them to me so that I can find a use for them. I'll even test them for you, should you desire.

The electronically-tuned TV/VCR tuners cover a wide band of frequencies, typically from 45-900 MHz, broken into 3-4 tuning bands depending on whether the tuner is "cable ready." This indicates that a super band is included. If the tuner is marked, the band indications will be BL (low VHF), BH (high VHF), BS (super band), and BU (UHF). Within the 45-900 MHz range are four ham bands, aircraft (both civilian and military), public service, hospitals, weather, taxicabs, phone systems, all TV channels, and many others.

To salvage a tuner from its resident equipment, you should observe and transfer any pin markings on the PC board to the tuner to make pin identification easier. But even without available markings, it is reasonably easy to identify the function of each pin. The specific difference between a TV and VCR tuner is the output (IF) frequency. For VCRs, the output is 63 MHz; for TV tuners, the output is 47 MHz. But even with the frequency difference, the tuners can be used alternately if need be. The supporting circuit design remains the same regardless of the IF used by the tuner.

It is best to test the tuner on the workbench prior to building it into a project. The more you know about the tuner, the easier it is to develop the supporting circuitry. All electronically-tuned tuners have pretty much the same voltage requirements, which are as follows: mixer/oscillator, 12V; tuning, 0-28V; AGC, 0-7V; band selection, 0V off and 12V enable; PLL, 5V; and AFT, ±1V.

Silent Solar Power

The $299.95 Bullet-Tested QRV Solar Power Supply keeps your repeater on the air 'round the clock or powers your 100w HF station 60 hrs a month. Control circuit speeds charge, protects get cells & sealed batteries. Fully assembled, QRV, portable. Easily expanded.

Add $10 S&H Info $1

AntennasWest
Box 50062 Provo UT 84605
(801)373-8425

CIRCLE 336 on READER SER'/ICE CARD

During the visual examination the various connectors need to be identified. For a VHF/UHF tuner, there will be two antenna connectors. The UHF connector will be two parallel pins and the VHF/super band will be a phono connector. Both antenna connectors will be on the same end of the tuner. On the opposite end of the tuner, one or two more phono connectors may be present. These are arranged close to the local oscillator and provide I/O access between the oscillator and the PLL circuit.

The multiple connector pins along one edge of the tuner provide access to the various tuner control circuits as shown in **Fig. 1**. It must be clearly understood that the pin configuration will be unique for each available tuner. Starting from the oscillator end of the tuner, the pins are typically as follows: IF output; PLL; mixer/oscillator; blank pin; band control; band control; AGC; band control; tuning voltage; and band control. Some tuners have an AFT terminal which is normally used for fine tuning.

Testing a tuner is straightforward in nature, but does require a receiver covering the tuner IF; two regulated power supplies; two 10k pots; a DVM; a VHF and/or UHF antenna; and a couple of short-length clip leads having small-size clips. For UHF, two wires, each about three feet long, can form a rabbit-ear-style antenna; a 146 MHz antenna will work well for VHF.

Fig. 2 shows a typical circuit for testing a tuner. The procedure for tuner setup is as follows: Set the receiver to 47 MHz (or 63 if a VCR tuner is used). Connect the antennas to their respective connectors. Set one power supply to +12V and connect the voltage directly to the mixer/oscillator pin. The negative voltage side connects to the tuner case. Connect one 10k pot across the 12V supply and adjust the output to 5-6 volts. Connect the wiper to the AGC pin. Connect the second pot across the second power supply and set the supply to +30V output. Adjust the pot (tuning voltage control) to 0V. Connect the pot wiper and a DVM to the tuning voltage pin. Connect a clip lead from the +12V output and temporarily attach it to one of the band control pins. During testing, the AFT terminal, if present, may be grounded.

Open the receiver squelch and very slowly adjust the tuning voltage from 0V to maximum, and back again. If you hear a station, stop to record the tuning voltage value and the band control pin number. If the station can be identified by a service, then it should also be noted. Critically adjust the AGC voltage for maximum sensitivity upon hearing the first station. Measure and record the AGC voltage and leave it set for all remaining tests. Repeat the tuning procedure for each band control pin.

F (MHz)	SERVICE
46	phone
49	phone / baby monitor
50	6 meter ham
88	FM BC
108	FM BC
116	aircraft
136	aircraft
146	2 meter ham
150	public service / taxi
162	weather
222	1-1/4 ham
230	mil. aircraft
445	70 cm ham
800	public service
886	phone
902	commercial / ham

Table 2. Frequency spectrum.

When checking the bands, use the chart shown in **Table 1** as a guide. For the UHF band, the only signals heard on the top of the band will be cell phone, and the tuning voltage will be in the range of 20-28 volts.

From the band control and tuning voltage information, a tuning voltage vs. frequency chart can be developed in a manner similar to that shown in **Table 1**. After the tuner has been tested and the voltage requirements noted, select and build a project around the tuner. Tune the spectrum as shown in **Table 2**. Again, if you aren't going to use the tuner, give it to me.

Next time: frequency converter, mobile power.

Build a Colloidal Silver Generator

Do-it-yourselfing has always been the heart of hamdom.

Thomas M. Miller WA8YKN
314 South 9th Street
Richmond IN 47374
E-mail: thomil@infocom.com

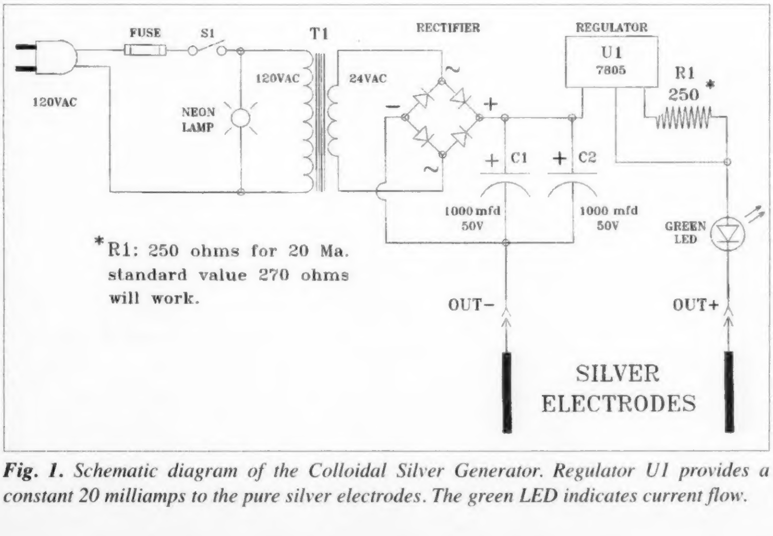
The discovery of antibiotics is often considered the most important breakthrough in modern medicine. Beginning with the introduction of penicillin in the early 1940s, one disease after another fell to the constant onslaught of new and more powerful drugs. Armed with this powerful new arsenal, many doctors believed that the end of all infectious disease was within their grasp.

Bacteria, however, are difficult to conquer. The oldest life form on the planet, they have survived, and thrive, virtually everywhere on Earth precisely because they are adaptive—capable of changing themselves in response to a hostile environment.

When bacteria are constantly exposed to antibiotics, they will do what they do best—adapt. If only a single bacterium manages to survive an antibiotic attack, that organism can produce over 16 *million* offspring within 24 hours, and each of these will inherit the ability to resist that drug.

In the late 1970s, new strains of disease-causing organisms began to emerge that were resistant to antibiotic drugs. Researchers have tried to counter by developing new and even more powerful drugs, but it appears to be a losing battle. More and more bacteria are becoming MDR (Multi-Drug Resistant), and new drugs are becoming more difficult and expensive to produce. And, while a new drug may take a decade to reach the pharmacy shelf, bacteria can mutate in hours.

> ***"Unlike antibiotic drugs, the use of silver does not produce resistant strains of bacteria."***



*R1: 250 ohms for 20 Ma. standard value 270 ohms will work.

Fig. 1. *Schematic diagram of the Colloidal Silver Generator. Regulator U1 provides a constant 20 milliamps to the pure silver electrodes. The green LED indicates current flow.*

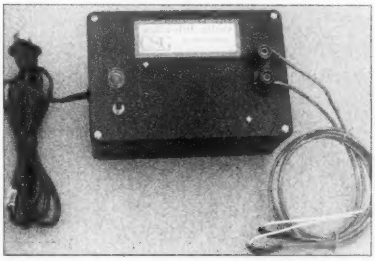


Photo A. *The Colloidal Silver Generator, with pure silver electrodes. Pure silver colloid, a natural antibiotic, can be made for the cost of distilled water!*

Don't despair!

Fortunately, alternatives to antibiotic drugs do exist, and the most promising is silver. Commonly used prior to 1938, silver is a natural broad-spectrum antibiotic. In fact, while most antibiotic drugs are effective against a select few types of bacteria, silver is known to kill over 650 different disease-causing bacteria, and many viruses as well—yet silver is completely non-toxic. Unlike antibiotic drugs, the use of silver does *not* produce resistant strains of bacteria.

Like other metals, pure silver is generally found in the crystalline state. The body, however, cannot utilize crystalline metals; they must first be transformed into the *colloidal* state. A colloid consists of extremely tiny particles of a substance, suspended (not dissolved) in pure water. Each particle contains only about 15 atoms, and is hundreds of times smaller than a red blood cell. Colloidal silver can be easily absorbed and utilized by the body to fight bacterial and viral infections. Some doctors believe that silver is necessary for proper operation of the immune system.

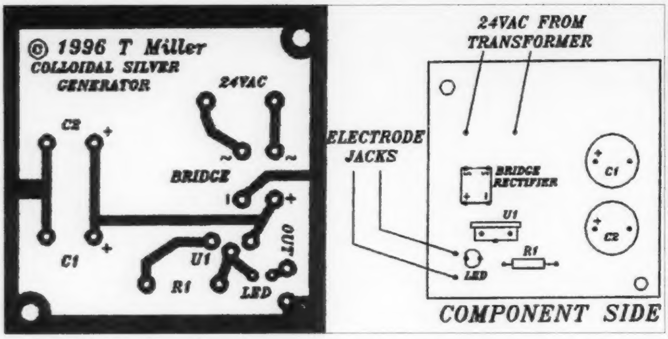


Fig. 2. Printed circuit board pattern (foil side) and component layout. Boards are available from FAR Circuits.

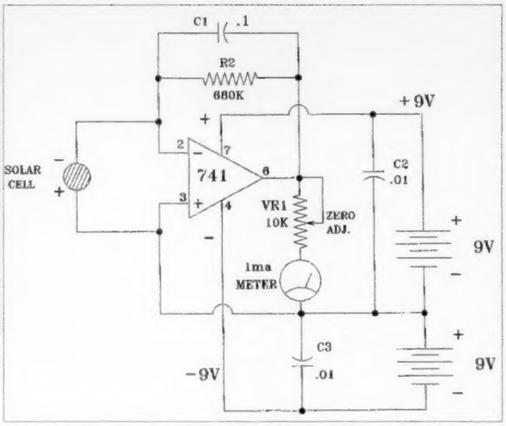


Fig. 4. Schematic diagram of the light meter used to check silver concentration. The circuit measures scattered laser light.

Before 1938, colloidal silver was manufactured by a mechanical method; the silver was actually crushed and ground to fine particles. Unfortunately, it is nearly impossible to grind a substance to the size of atoms, so this method produced a very poor-quality colloid. Today, colloidal silver is produced by an electric process that results in extremely fine particles. Since these particles carry an electric charge, they repel one another and remain suspended in an electric field. This helps prevent the silver particles from settling to the bottom.

It couldn't be easier...

A daily tablespoon of colloidal silver can be taken orally, either alone or mixed with water or juice. It can be absorbed directly by simply holding a small amount in the mouth for a minute or two. It also promotes healing and prevents infection when used externally on cuts, scrapes and rashes. Colloidal silver can be sprayed on kitchen countertops, added to laundry and bath water, used to sterilize canning jars and lids, and even added to your pet's water dish to prevent bacterial growth.

The one drawback to this amazing substance is the cost. Colloidal silver is available in most health food stores as well as by mail, but the average cost is between $5 and $10 per ounce! This high cost prohibits most of the applications we've mentioned, since it would cost $100 to fill an average spray bottle. Also, tests have shown that the quality and purity of the colloidal silver on the market varies widely, and it's hard to tell exactly what you're getting.

The answer to these problems is to do what hams do best—make it yourself! The circuit required to generate a silver colloid is simple, and once built, will make hundreds of gallons for virtually the cost of the water.

"...Silver colloid solution may be the most useful health enhancement tool in your environment." — Bob Beck

A few months ago, a reader sent me a paper written by Physicist Bob Beck. In this paper, Dr. Beck described his circuit for making colloidal silver, which consisted of three 9-volt batteries connected to provide 27 volts, a 28-volt 40-milliamp light bulb, and two electrodes made of pure silver wire. The light bulb, wired in series with one electrode, acted as a ballast resistor to limit the current. Since distilled water does not conduct electricity very well, a tiny amount of pure salt is added until the bulb produces a "dim glow." Five minutes of this will, according to Dr. Beck, produce a high-quality colloidal silver concentration of 5 to 7 ppm (parts per million).

I built Dr. Beck's circuit, and it did indeed produce colloidal silver. The only drawback I found was that the "dim glow" of the bulb was a somewhat subjective indication of current, which varied with the conductivity of the water, the condition of the batteries and the length of electrodes immersed in the water. This made it difficult to get repeatable results. What was needed was a circuit with fewer variables.

With this in mind, I designed the circuit shown in **Fig. 1**. The circuit uses a small 24-volt transformer, a bridge rectifier, and two electrolytic capacitors to form a small AC-operated power supply. This supply provides 32 to 35 volts DC to a 7805 regulator, which is connected as a constant-current source. Since Dr. Beck's current indicator was a 40-milliamp bulb lit to half-brilliance, I selected the resistor R1 to provide 20 milliamps, allowing the use of a standard Light-Emitting Diode (LED) as an indication of proper operation.

This is a very simple and non-critical circuit, and could easily be wired point-to-point on a small piece of perfboard. However, to make the circuit as easy to build as possible, a circuit board pattern and parts layout is shown in **Fig. 2**. I mounted the completed circuit in a small

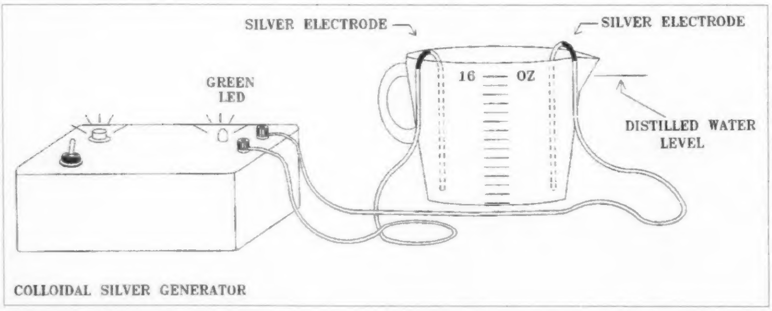


Fig. 3. Making silver colloid is easy; use a glass measuring cup and 16 ounces of distilled water. Let the generator run for 5 to 7 minutes.

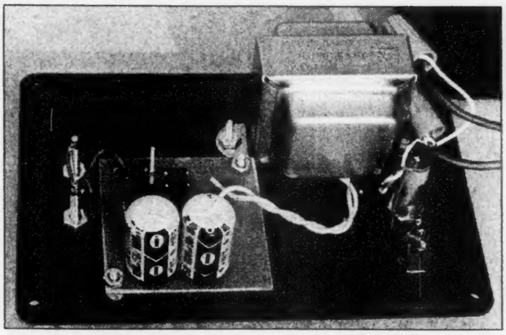


Photo B*. Inside the colloidal silver generator. The LED is mounted on the back of the circuit board and extends through the front panel.*

plastic project box with the AC switch and pilot lamp on the left side of the panel. I put the LED and a pair of binder posts to connect the electrodes on the right. The completed Colloidal Silver Generator is shown in **Photo A**.

The most critical component of this project is the electrodes. They **MUST** be made of .999 fine silver. **DO NOT** under any circumstances use "sterling" or any other silver alloy, as the metals used can be toxic in even very small amounts.

Cut two pieces of #12 round fine silver wire, each 4 inches long. Solder a 24-inch piece of flexible insulated hookup wire to one end of each electrode. Clean each solder joint with flux solvent and coat the solder with a drop of clear urethane varnish or nail polish. Slip a 1-inch long piece of shrink tubing over each wire and push it down to cover the solder joint. Use a heat gun to shrink the tubing over the connection.

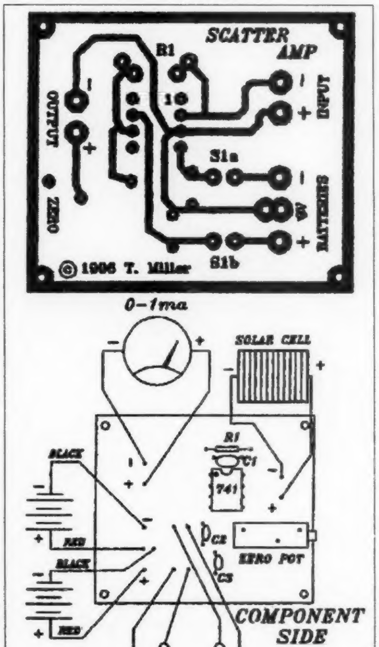


Fig. 5*. Circuit board pattern (foil side) and parts layout for the light meter. The solar cell is very fragile, so handle with care.*

Using needle-nose pliers, bend the upper portion of each electrode, just below the solder joint, in a "U" shape about one-half-inch wide. When the electrodes are hooked over the side of the glass, about three inches of silver wire should extend down into the water. Note that the shrink tubing and solder joint **MUST NOT** be submerged! You do not, after all, want to make "colloidal lead" or "colloidal tin." Strip the ends of the electrode cables and connect them to the Colloidal Silver Generator.

> ***"Every mineral that exists is dissolved in the sea, and therefore is also present in sea salt."***

You will need some distilled water and also some non-iodized salt. Don't use iodized salt, as the iodine could make unwanted chemical compounds. Also, some brands of salt use aluminum silicate as a desiccant, and while it's not likely that this could be harmful in such tiny amounts, I checked the labels until I found one that uses sodium silicate instead of aluminum.

Some people have suggested using "sea salt" as an alternative to table salt. Sea salt is the residue left behind when seawater is evaporated away. Not only iodine, but *every mineral that exists* is dissolved in the sea, and therefore is also present in sea salt. In fact, sea salt is sometimes used in place of table salt as a trace-mineral supplement. Use only pure, plain, non-iodized salt.

Colloidal silver should be made and stored in a glass container. Plastic can hold a static electric charge which will cause the silver particles to collect on the sides. I use a 16-ounce glass measuring

NINE-BAND HF
ANTENNAS 100 W
NO MAST REQUIRED
ALMOST UNSEEN PLACED
ON TOP OF ROOF TILES
EMDR 1 28 ft $369 incl. Airmail
for single story home
EMDR 2 50 ft $399 incl. Airmail
for taller residence
SMALLEST WIDEBAND LOOP
EVER DESIGNED FOR 9 BANDS
CFL 2 diam. 2 1/2 ft $499 incl. Airmail
for car, mobile home, or balcony
For data or orders FAX early any day
+ 44 1 224 316 004 (Mastercard/Visa)
HATELY ANTENNA
TECHNOLOGY GM3HAT
1 Kenfield Place, Aberdeen AB15 7UW
Scotland, UK
CIRCLE 258 ON READER SERVICE CARD

208-852-0830
http://www.rossdist.com
SPECIAL! $62.00
MFJ 815B
Cross-Needle
1.8-60MHz
SWR/Wattmeter
RDC
Check Out Our Specials! We're On The Web.
Over 9030 HAM Items in Stock. All Prices Cash FOB Preston
ROSS DISTRIBUTING, 78 S. State Street, Preston, ID 83263
Hours Tue.-Fri. 9-6 • 9-2 Mondays. Closed Saturday & Sunday
CIRCLE 254 ON READER SERVICE CARD

BIOELECTRIFIER
PLANT GROWTH STIMULATOR
NOW AVAILABLE IN KIT FORM!
- COMPACT SIZE, 2.4" X 3.8" X 1"
- ADJUSTABLE OUTPUT UP TO 30 VOLTS
- 316 STAINLESS STEEL ELECTRODES
- KIT INCLUDES ALL ELECTRONIC COMPONENTS, ASSEMBLY INSTRUCTIONS AND PLASTIC ENCLOSURE. BATTERY NOT INCLUDED.
- FOR MORE INFORMATION -
SEND SASE TO:
SEAGON COMPANY
5541 OAKVILLE CENTER
SUITE 215
ST. LOUIS, MO 63129-3554
CIRCLE 241 ON READER SERVICE CARD

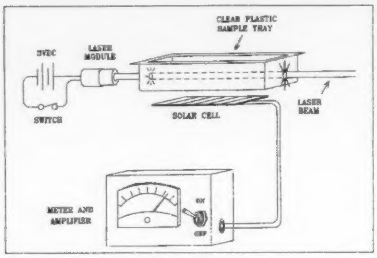


Fig. 6. Method for checking silver concentration. The solar cell comes packaged in a plastic "bubble pack" which makes a perfect sample tray.

cup. Hook an electrode over each side of the rim, and fill the cup with distilled water. The electrodes should extend down into the water, but remember that the solder joint must be above the water line. The proper setup is shown in **Fig. 3**.

When you first turn on the Colloidal Silver Generator, the pilot lamp will glow. The green LED may glow very faintly, or not at all, depending on the conductivity of the water. Add a tiny amount of salt, just a few grains at a time, and stir gently with a plastic spoon. Add just enough to make the green LED glow to normal brightness. If you look closely at the positive electrode, you will see a wispy cloud of silver particles coming off into the water like faint white smoke. After five minutes, turn off the Colloidal Silver Generator, remove the electrodes from the cup, and gently stir the colloidal silver with a plastic spoon. Silver is sensitive to light, so keep the colloidal silver in a dark brown glass bottle and store it in a cool, dark place. Always shake the bottle before using your colloidal silver.

After each use, the electrodes must be polished slightly to remove the oxide and scale. Use a small piece of fine synthetic scouring pad, such as Scotch-Brite™, and gently polish them until they are clean. Avoid over-polishing, since you don't want to wear away the silver.

Testing the concentration

After making a bottle of colloidal silver, I realized that I had no way to determine exactly how much silver was in suspension. Colloids are measured in parts per million (ppm), and the concentration of most commercial colloidal silver is in the 5 to 10 ppm range. With a constant current regulator and a measured amount of distilled water, the only remaining variable is time: How long does it take to make a 5 ppm concentration of colloidal silver?

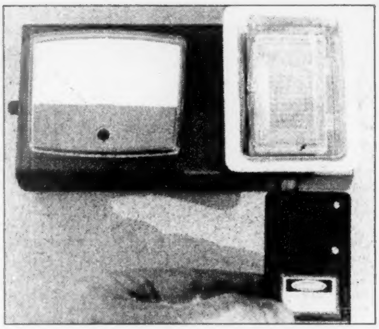


***Photo C.** Since the radius of the silver ion is less than 2 angstroms, far too small to see, silver concentration is checked with a diode laser and a light meter to measure the scattered light. Five to ten parts per million (PPM) is ideal.*

Learn by Example!

The PRIMER 8085 Based Microprocessor Training and Control System shows you how to program by example. Examples & exercises in the Self Instruction manual take you from writing simple programs to controlling motors. Start out in Machine language, then move on to Assembler, & then continue on with optional C, Basic, or Forth Compilers. This trainer can be used stand alone via the keypad and display or connected to a PC with the optional upgrade ($49.95). The Upgrade includes: an RS232 serial port & cable, 32K of battery backed RAM, & Assembler/Terminal software.

PRIMER

Examples Include:
- Measuring Temperature
- Using a Photocell to Detect Light Levels
- Making a Waveform Generator
- Constructing a Capacitance Meter
- Motor Speed Control Using Back EMF
- Interfacing and Controlling Stepper Motors
- Scanning Keypads and Writing to LCD/LED Displays
- Bus Interfacing an 8255 PPI (new)
- Using the Primer as an EPROM Programmer

The PRIMER is only $119.95 in kit form. The PRIMER Assembled & Tested is $169.95. Please add $5.00 for shipping within the U.S. Picture shown with upgrade option and optional heavy-duty keypad ($29.95) installed.

EMAC, inc.
11 EMAC WAY, CARBONDALE, IL 62901
618-529-4525 Fax 457-0110 BBS 529-5708
World Wide Web: http://www.emacinc.com

1985 - 1997
OVER
12
YEARS
OF SERVICE

CIRCLE 142 ON READER SERVICE CARD

Motron Electronics
310 Garfield St Suite 4
PO Box 2748
Eugene, Oregon 97402
Only $99.00
http://www.motron.com

Control your home from your radio!

The Auto-Kall® AK-16 DTMF Controller Board features 16 relay driver outputs and DTMF to X-10 house control capability! Using your radio keypad, you can control either the relay outputs, X-10 modules, or both! X-10 operation requires the PL-513 Power Line Interface ($20). The AK-16 mates readily with our **RB-8/1** ($99) or **RB-16/1** ($149) relay boards. The 0-12 digit security code is user programable using your DTMF keypad. Additional features include reprogramable CW ID and several modes of operation, including two with CW response tones. Printed circuit board, assembled and tested. Visa, MasterCard, American Express, Discover Card COD on Cash or Money Order basis only S/H: $8 USA; $11 Canada; $16 Foreign. COD: $5

Price and Specifications are subject to change without notice
Se Habla Español. Pida por Don Moser.

Orders: (800) 338-9058
Info: (541) 687-2118 Fax: (541) 687-2492

Dr. Beck's article recommended using a small laser pointer to check the silver concentration. These pointers use a laser diode to produce a visible red beam. I ordered a laser diode module and mounted it, along with two 1.5 volt "N" cells and a switch, in a small plastic box.

The laser beam, shining through a sample of distilled water, is invisible when viewed from the side. However, when the laser is directed through colloidal silver, it makes a softly glowing red beam due to the tiny silver particles scattering the light. The intensity of the glow is proportional to the concentration of silver—the more particles there are in suspension, the more photons will be scattered. Simply looking at the glow, however, does not give an accurate measurement. I needed a way to actually measure the scattered light.

RadioShack™ sells a small silicon solar cell (part number 276-124). I bought one of these cells, and *carefully* cut the plastic bubble-pack from the solar cell package—the clear plastic bubble is just the right size to make a small transparent sample tray. I built a small amplifier to drive a meter and attached it to the solar cell. By placing the clear plastic sample tray on top of the solar cell and directing the laser beam through the sample, I could directly measure the scattered light. Of course, the solar cell was also sensitive to normal room light, so my first experiments were done in the dark. I set up the sample and shut off the lights before turning on the amplifier. Later, I made a small cardboard box which I could place over the sample under test.

I first tested a sample of colloidal silver and adjusted the meter zero pot until the meter read full scale. Then I mixed a sample diluted 50% with distilled water—the meter read half scale! A sample of distilled water read nearly zero, with only a tiny amount of reflected light caused by the sides of the sample tray.

This method worked, but it provided only a relative reading. To calibrate it, I filled the sample tray with a commercial 5 ppm colloidal silver purchased at a local health food store. I adjusted the meter zero to read "5" on a 0 -15 scale, then tested a sample which I had made by running the Colloidal Silver Generator for exactly 10 minutes. This sample registered nearly "10" on the meter; double the concentration of the commercial product.

It was clear to me that running the Colloidal Silver Generator in 16 ounces of water for five to seven minutes will produce an ideal concentration of silver. Therefore, if your only interest is in making your own colloid, it's not necessary to build the light meter. I have included the circuit here for those who wish to experiment with the laser backscatter phenomenon.

Fig. 4 shows the schematic diagram of the meter amplifier, while the circuit board pattern and layout is shown in **Fig. 5**. There is nothing critical about the circuit, but note that the solar cell is *extremely* fragile, and you must carefully solder wire leads to each side. Use only small, flexible wire to avoid placing any stress on the solar cell. I used a piece of tiny two-conductor wire from an old earphone. **Fig. 6** shows the method used to measure the laser backscatter.

I would enjoy hearing from readers about their experiences with colloidal silver. The easiest way is via the Internet: My E-mail address is thomil@infocom.com. Also, information on this and many other circuits is available on my Web page. If you have access to the Web, the URL is: http://www.infocom.com/~thomil/.

Letters sent via the U.S. Postal Service will also (eventually) reach me. If you write, please include an SASE.

Further reading:

"Colloidal Silver, What the Pharmaceutical Cartels Don't Want You to Know," *American Survival Guide*, August 1996

"Silver, Our Mightiest Germ Fighter," *Science Digest*, March 1978

"Currently Preferred Silver Colloid Making Apparatus, Means and Methods," Robert C. Beck, August 1995

"A Few Unique Plus Traditional Uses For Silver Colloid," Robert C. Beck, August 1995

Acknowledgments

Thanks to Justus Parrish, metallurgist, author and president of Metallurgical Services of Richmond, Indiana for his insight into testing metallic colloids.

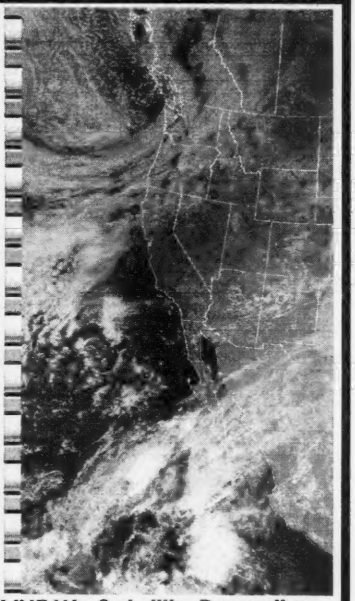
Special kudos to the eminent and somewhat elusive physicist, Robert C. Beck, D.Sc., for his many original ideas and his willingness to share them with experimenters.

Continued on 81

FREE!
NEW CATALOG
CALL TOLL FREE: 1-800-JAN-XTAL
Quality Crystals
and Oscillators for:
AMATEUR BANDS•CB•MARINE VHF
SCANNERS•MICROPROCESSORS•PAGERS
P.O. Box 60017 • Fort Myers, Florida 33906
VISA (941) 936-2397
JAN Crystals
CIRCLE 242 ON READER SERVICE CARD

ISOTRON
ANTENNAS FROM 160-10 METERS
NO TUNERS
NO RADIALS
NO COMPROMISE
PRICES START AT $49.95
SEVEN EXCELLENT REVIEWS
JUST DON'T HAPPEN BY CHANCE
CALL US FOR A FREE CATALOGUE
See review in 73, Oct. 1984; 73, Sept. 1985; 73, March 1986
CQ, Dec. 1988; W.R., Mar. 1991; 73, Nov. 1994; 73, Apr. 1996
ASK ABOUT OUR NEW ISOTRON 160C!
BILAL COMPANY
137 MANCHESTER DRIVE
FLORISSANT, COLORADO 80816
(719) 687-0650
MasterCard VISA
CIRCLE 42 ON READER SERVICE CARD

Get The Picture!



VHF Wx Satellite Decoding
Call or write for our free catalog
Software Systems Cosulting
615 S El Camino Real
San Clemente CA 92672
Tel (714) 498-5784 Fax (714) 498-0568
www.sscorp.com
CIRCLE 250 ON READER SERVICE CARD

73 Review

Cable X-Perts' G5RV Multiband Antenna Kit

What to do when you're tired of making do.

Peter A. Bergman N0BLX
3517 Estate Dr. SW
Brainerd MN 56401

After several years of using dipoles strung from trees and whatever, I decided to get more organized and try something different. House wire and lamp cord just weren't doing the job for me.

I thought about just getting some hard-drawn wire and using it to replace my dipoles, but I had worked a number of stations that were using G5RVs and decided to give that a try.

While the G5RV looks like an open-line-fed dipole, it differs in a couple of ways. A conventional dipole is cut to a half-wavelength on the lowest frequency of interest. However, a full-size G5RV is cut to 3/2 waves at 14.15 MHz (102 feet) and uses 34 feet of open line as a matching section. This provides a pretty close match to feedlines with impedances of anything from 50 to 80 ohms, either twinlead or coaxial cable. Since the whole system will be brought to resonance with a tuner anyway, the standing waves on the feedline won't matter too much.

While the 34 feet of ladderline functions as a matching transformer on 20 meters, on the rest of the bands it functions as a "make-up" section to accommodate that portion of the standing wave (voltage and current components) which cannot be handled on the flattop.

Since there are no ferrite beads or traps involved, the G5RV tends to be very efficient. On 80 meters the pattern looks like a typical dipole. On 40 and 30 the pattern is similar to that of two half-waves fed in phase. On 14, 18, 21, 24 and 28 MHz the pattern is that of a long-wire antenna.

The full-sized G5RV can also be used on the 160-meter band by shorting the feedline and bringing the antenna to resonance with a series-connected capacitive-inductive tuner. The tuner, of course, must be connected to a good earth ground or counterpoise wire.

If space is limited, the flattop and matching section can both be shortened by half, which will produce an efficient antenna for seven through 28 MHz. If you want to use the half G5RV on 160 and 80 meters, the above tuner and shorting arrangement will have to be made. In this case the G5RV will perform more like a top-loaded vertical but should still provide good performance.

Since it probably won't be practical to connect the transmitter directly to the matching section, some kind of feedline will be necessary. According to what I've read, almost any line—coax or parallel—with an impedance of 50 to 80 ohms will work. Try to keep the feedline under 70 feet in length. The use of a balun is not recommended.

After thinking about it for a while and checking the junk box—where I found mostly junk—I decided to order the G5RV kit from Cable X-Perts.

This is a *kit*?

The hefty box arrived in a very few days, which was gratifying. The contents (**Photo A**) included 104 feet of 14-gauge 7/22 hard-drawn copper wire, 35 feet of 450-ohm ladderline, two end insulators, a center insulator and a 450-ohm ladderline-to-coax adapter. Also included was a detailed set of instructions and a reprint of an article by Louis Varney G5RV himself. The article explains the theory of operation of the antenna and adds some detail on the proper installation.

Calling this a kit is a bit of a stretch, since the whole assembly job can be done on the kitchen table in just a few minutes. There are only four solder connections to make, but you will definitely want to use a gun for this job. Especially

CABLE X-PERTS, INC
$25.00

Photo A. *Cable X-Perts' G5RV multiband antenna kit.*

on jobs where a lot of material is involved, I prefer to do my soldering indoors or at least out of the wind. It can be difficult enough to get a joint hot enough for the solder to flow properly when you have 85 feet of copper wire sucking heat away without having the wind cooling it, too. I have even been known to drag the end of an antenna into the car just to get out of the wind.

Installing the antenna should be pretty straightforward. Make sure you unroll the wire and the ladderline. Don't just pull it off the roll sideways like line coming off a spinning reel. If you unroll it there will be less risk of getting kinks in it and the wire should hang straighter.

The G5RV can be installed as an inverted vee, but the angle is supposed to exceed 120 degrees. It's best to think of it as a flattop. The ladderline should hang in the clear as much as possible, and at least the top twenty feet of it should hang vertically. Naturally, it's best if the antenna is mounted high enough that the entire matching section is vertical and the connection to the feedline is suspended above the snow (in my case it requires a center support about 40 feet high—so much for global warming).

How does it work?

Some users who have been able to hang the antenna above 35 feet with the matching section in the clear have reported VSWRs of two or less throughout most of the HF ham bands. My situation is not nearly so ideal, but it requires very little tweaking with the tuner to achieve unity SWR anyplace I want it.

I sometimes work QRP and never use more than 80 or 90 watts; as far as efficiency is concerned, the G5RV is a vast improvement over what I'd been using. I am getting closer to the ideal of "hear them and work them."

Whether you're an old hand at all this, or a newcomer looking for your first HF antenna, give the G5RV some consideration. Or, if you have some other antenna design in mind and are looking for quality materials, take a look at the Cable X-Perts catalog. I think you'll be pleased. For further information, contact Cable X-Perts, 416 Diens Dr., Wheeling IL 60090; to order ($25 plus $6.50 s&h) call (800) 828-3340; for technical information call (847) 520-3003; FAX (847) 520-3444.

Number 27 on your Feedback card

An 8088 Clock Upgrade

Recycle!

Lisa Davis
2830 W. Kent Drive
Chandler AZ 85224

Evert Fruitman W7RXV
2808 West Rancho Drive
Phoenix AZ 85017-2646

You would probably be hard pressed to find a man-made computer older than the abacus. The masters of this somewhat primitive machine could do calculations with great dexterity and surprising speed. Today, you are more likely to find one in a curio shop than in a business or a scientific laboratory.

Once the early computer developers got past the beads and wires of the abacus, they tried many different things for the switching and the storage elements. Relays, vacuum tubes, and transistors all served the purpose. Eventually, engineers combined many transistors into one package, making the now common integrated circuit. This gave a saving in space, a notable increase in speed and a monumental increase in complexity.

At first, those who had to do many complex computations found the accuracy of these mechanical computers somewhat of a delight. But when programmers found that the machine could do calculations much faster than people, as well as more accurately (most of the time), speed soon became the primary goal.

Just a short time ago, a dual-speed 4/6 MHz system was considered state of the art. Now a system that runs slower than 100 MHz seems outdated. As the 8088 gave way to the faster 80286, and the '286 gave way to the '386 to the '486 and finally (for now, that is) the Pentium™, the older processor boards found their way to the scrap heap more and more frequently. Here is a modification for one of those old boards that could put it back on your desktop, or even on your wall.

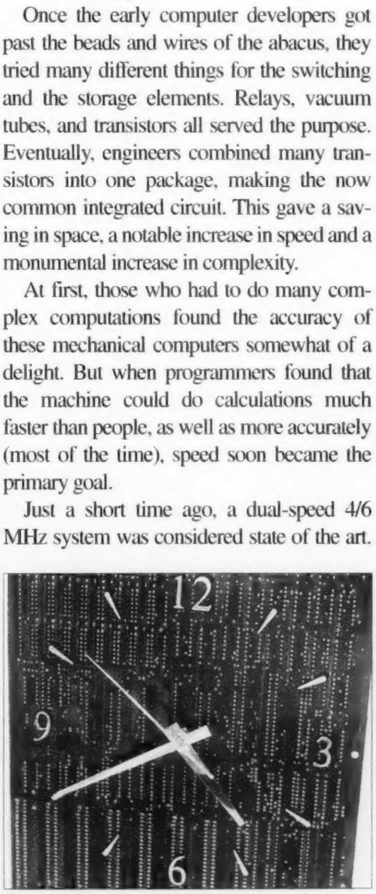


***Photo A.** Front view of the 8088 clock.*

The modification

As the photo shows, this modification uses an external clock. However, do not panic—you can find this critical component at a hobby/craft store. Although the original plans call for an 8088 motherboard, any other board about the same size will give equally pleasing results. Simply look for a clock suited to the dimensions of your particular board. While at the store, you may want to consider the possibility of framing your finished system. It should take less than an hour to make the improvements to the 8088 board.

Start the modification by locating the center of the board. With a small electric drill and a high-speed bit, drill the mounting hole indicated in the instructions that come with the clock. Next, mount the clock, attach the hands and the numbers, then install the battery and set the clock to the correct time of day. Finally, locate a suitable spot on your desk or wall and set it in its newfound place of honor. This simple, relatively inexpensive modification gets some of those old boards out of the scrap pile by making an upgraded 8088 board into a system suitable for use on your desk or wall. In our case, the clock made a nice gift for someone who works with computer hardware and software all day and found the clock a delightful addition to his office wall.

Mr. NiCd YOUR SOURCE FOR
BATTERIES!
* AMATEUR RADIO BATTERY PACKS
* REPLACEMENT RECHARGEABLE INSERTS
* LAPTOP COMPUTER BATTERIES
* CAMCORDER BATTERY PACKS
* CELLULAR PHONE BATTERY PACKS
* SEALED LEAD-ACID BATTERIES
* O.E.M. & CUSTOM ASSEMBLY PACKS
* AUTHORIZED SANYO NiCd DISTRIBUTOR
Call or write for our free catalog!
Mr. NiCd -E.H. Yost & Co.
2211-D Parview Rd., Middleton, WI 53562
Phone (608) 831-3443 / Fax (608) 831-1082
DEALER INQUIRIES INVITED
CIRCLE 114 ON READER SERVICE CARD

Where's the Beam?
Unobtrusive DX Gain Antennas for 80 thru 10
• Easily hidden • Install Fast • Fixed or Portable •
There's a 20 meter antenna with real DX Punch hidden in this picture. You can't see it, and your neighbors can't either. But it works DX barefoot anyway. How about a low profile 80 40 30 tribander? Or a 2 element monobander for the attic? All easily fit the pocketbook--Priced $29 to $99.
Work DX without telling the neighbors
Infopack $1
AntennasWest
Box 50062-R, Provo, UT 84605 (801) 373-8425
CIRCLE 332 ON READER SERVICE CARD

World's best ham weather station* – only $379
Others from $179
NEW!
New Model 2000:
Helps you alert others to weather extremes via A.P.R.S. or on SKYWARN and A.R.E.S. networks. Features accurate: • barometric pressure • 3-hr. pressure change • indoor/outdoor humidity† • dew point† wind speed/direction • indoor and outdoor temperature • wind chill temperature • rainfall†. Instant access to: • current values • today's highs and lows • yesterday's highs and lows • long term highs and lows • time/date for all highs/lows • rain totals† for today, yesterday and long term • alarms • 4-mode serial port, and more.
Actual size: 6 3/4" x 1 1/4"
The ULTIMETER 2000 is a great value: only $379 + shp'g. (†Optional sensors add'l.)
*Even WeatherWatch Magazine (May, '96), known for its hard-hitting, authoritative reviews, concludes "the best we have seen."
Call or write for free brochures.
1-800-USA-PEET
or 908-531-4615 FAX: 908-517-0669
PEET BROS COMPANY
1308-7047 Doris Ave., Ocean, NJ 07712
Visit our Home Page at www.peetbros.com

The California Phased Array

Easy to build, easy to use—and even easier on the billfold!

Dave Evison W7DE
153 Park Avenue
Palo Alto CA 94306

If you're interested in a compact, small-footprint wire antenna for 20 meters that has an honest 3 dB gain, is electronically rotatable, requires no tuner, and can be built for less than $25, read on—because that describes the California Phased Array.

The design constraints for the original California Phased Array were my very thin billfold, small city lot, TenTec Scout (50W), and a couple of palm trees. Since the palm trees are about 50 feet tall and spaced about 40 feet apart, I figured I had a couple of environmentally-correct towers. The immediate response was to simply stretch a dipole between my "organic supports." This I did, and though it worked admirably, I pined for something with gain and directivity. The technical requirements began to form in my mind: No radials, feedpoint at least 1/4 wave off the ground, and gain of 3 dB. From these points, the California Phased Array was conjured.

Say "abracadabra"

The antenna is actually a pair of half-wave wire dipoles, vertically oriented, and fed in phase or 180° out of phase—hence a two-element broadside or endfire array (and a "California" Phased Array because of the palm trees). Using half-wave dipoles eliminated the need for a radial system, ensured the smallest possible footprint, and elevated the feedpoints greater than 1/4 wave above earth ground (see **Fig. 1**).

The dimensions for the dipoles and phasing lines were calculated from the standard antenna formulas at 14.2 MHz, and they are specified in **Fig. 2**. Although the original California Phased

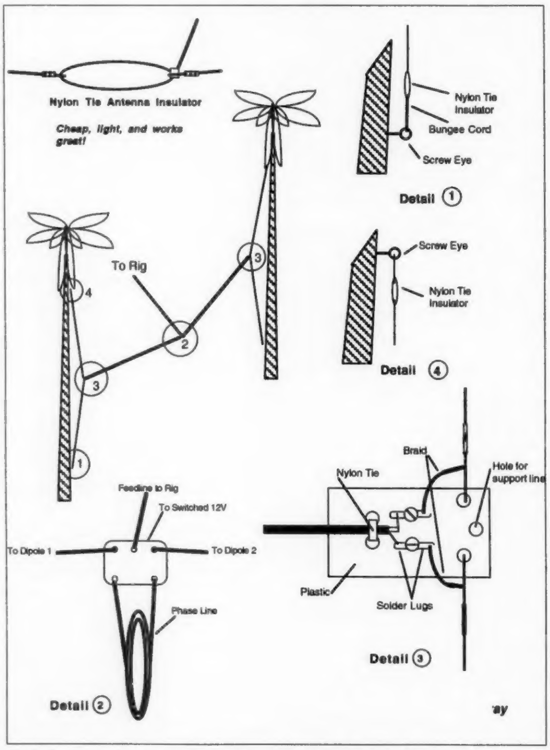


Fig. 1. See why it's a "California" phased array?

Internet Access Compliments of EriNet

DAYTON hamvention® 97

May 16, 17, 18, 1997 ■ Hara Arena, Dayton Ohio

SPONSORED BY THE DAYTON AMATEUR RADIO ASSOCIATION, INC.

TICKET DEADLINES

- Advanced registration orders must be postmarked no later than May 2 (USA) or April 25 (Canada). Tickets will be mailed after January 15,1997.
- Ticket requests that are received **AFTER** the deadline will be processed and **HELD** for pick-up at the Hamvention Office at the Conference Center entrance beginning Thursday, May 15 at 8:00 a.m.

EXHIBIT SPACE

See our Web site for more information.

- **Inside Exhibit Booths**
  For an application, please Fax (937) 376-4648 or E-mail to exhibits@hamvention.org
- **Outdoor Flea Market Space**
  For an application, please Fax (937) 253-1289 or E-mail to fleamkt@hamvention.org
  Flea market spaces are sold IN ADVANCE ONLY. No spaces sold at gate!

UNOFFICIAL ACTIVITIES

To be listed in our Program and on our Web site, please Fax (937) 274-8369 or E-mail to info@hamvention.org

SPECIAL SERVICES

- A limited number of Handicap parking permits are available.
- License Exam are by appointment only.

Details are available via FAXMail or the Web.

BUS SERVICE

Bus service will be provided between Hamvention, Air Force Museum, Salem Mall and Forest Park Mall parking areas. Check our Web site for additional parking areas.

COMMUNICATIONS

MAIL: Hamvention, Box 964, Dayton, Ohio 45401-0964

FAX (incoming): (937) 274-8369

E-Mail: info@hamvention.org

WWW: http://www.hamvention.org

FAXMail: (Outgoing) You must have a touch tone phone and call *from your Fax machine.* Set your Fax to manual send/receive, then call (937) 276-6934 and listen for voice instructions.

PHONE: (937) 276-6930. Chairman Voice Mail box numbers are available via FAXMail or the Web.

GIANT THREE-DAY FLEA MARKET

EXHIBITS

ACTIVITIES FOR THE NON-HAM

General Chairman: Dick Miller, N8CBU
Asst. General Chairman: Jim Graver, KB8PSO

ADVANCE REGISTRATION

FOR CHECK ORDERS:

Make checks payable to: Dayton HAMVENTION
Enclose the amount indicated in U.S. dollars and type or print your name and address clearly. *A $25 service charge will be assessed on all returned checks.* Do not send credit card orders to this address!

Mail to: Dayton Hamvention Box 1446, Dayton, OH 45401-1446

FOR CREDIT CARD ORDERS:

Add $1.25/ticket service charge FAX to (937) 278-4633 or mail to: Dayton Hara Arena • 1001 Shiloh Springs Rd. • Dayton, OH 45415. *Do not send checks to this address!*

	Quantity		
Admission .... (valid all 3 days)	______	@ $13.00*	= $ ______
Grand Banquet	______	@ $25.00**	= $ ______
Alternate Activities			
Saturday Luncheon	______	@ $10.00	= $ ______
Sunday Luncheon	______	@ $10.00	= $ ______
Credit Card Service Charge.	______	@ $1.25/ticket	= $ ______
		Total	$ ______

* $15.00 at door **$30.00 at door, if available

☐ ☐

Expiration Date: Month Year

Name ______ Call ______
Address ______
City ______ State ______ Zip ______
Daytime Phone ( ) ______ Evening Phone ( ) ______

PLEASE PRINT! THIS IS YOUR RETURN LABEL.

DAYTON hamvention® 97

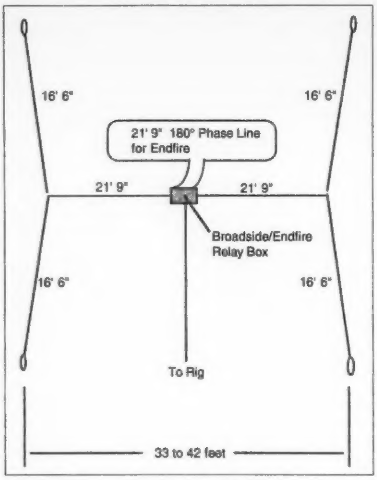

16' 6"
16' 6"
21' 9" 180° Phase Line for Endfire
21' 9"
21' 9"
Broadside/Endfire Relay Box
16' 6"
16' 6"
To Rig
33 to 42 feet

***Fig. 2**. Dimensions of W7DE's setup.*

Array was designed around the palm trees as supports, and the dipoles are separated by approximately 40 feet, other available supports and spacings can be utilized (H-plane patterns for the California Phased Array, depending upon your final spacing, can be found in *The ARRL Antenna Book*). Some alternate physical configurations are illustrated in **Fig. 3**.

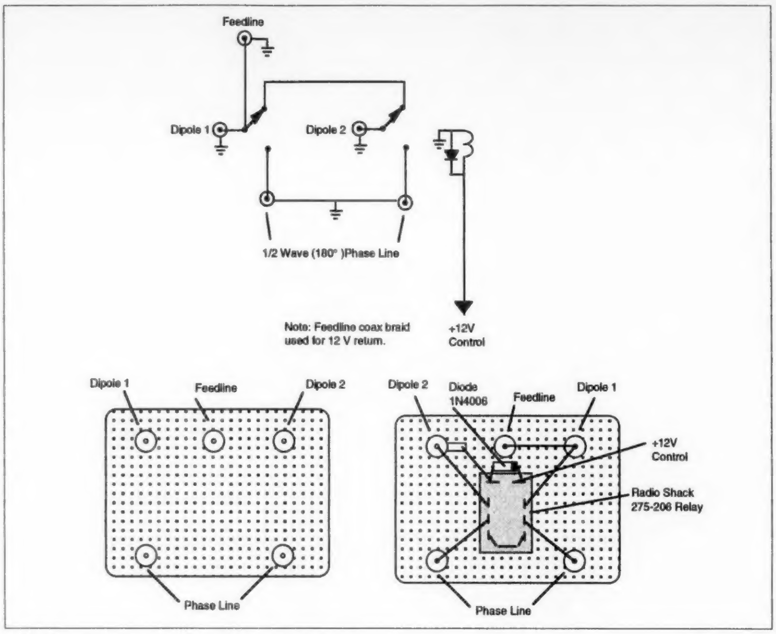

Feedline
Dipole 1
Dipole 2
1/2 Wave (180°)Phase Line
Note: Feedline coax braid used for 12 V return.
+12V Control
Dipole 1
Feedline
Dipole 2
Phase Line
Dipole 2
Diode 1N4006
Feedline
Dipole 1
+12V Control
Radio Shack 275-206 Relay
Phase Line

***Fig. 4**. Remote control box for electronic rotation.*

Details for the relay assembly that switches the additional half-wave phasing line in and out (to rotate the array electronically) are shown in **Fig. 4**. The relay and BNC connectors were assembled in a small metal enclosure. The shield of the coax feedline is used for the DC return when energizing the relay coil.

The initial checkout of the antenna was performed on the broadside configuration. I measured each dipole individually and found it to be flat across the band and about 47 ohms. When I connected the phasing lines of the antennas together, I fully expected to see something around a 2:1 SWR (about 23 ohms); instead, I found virtually no SWR and 47 ohms across the entire 20-meter band. I even changed the battery in the little MFJ SWR analyzer, and still got the same measurements. Here's why: If an array of two identical elements is fed in phase or 180° out of phase, both elements have the same feedpoint impedance. With these arrays, feeding the elements through equal lengths of feedline (in phase) or lengths differing by 180°

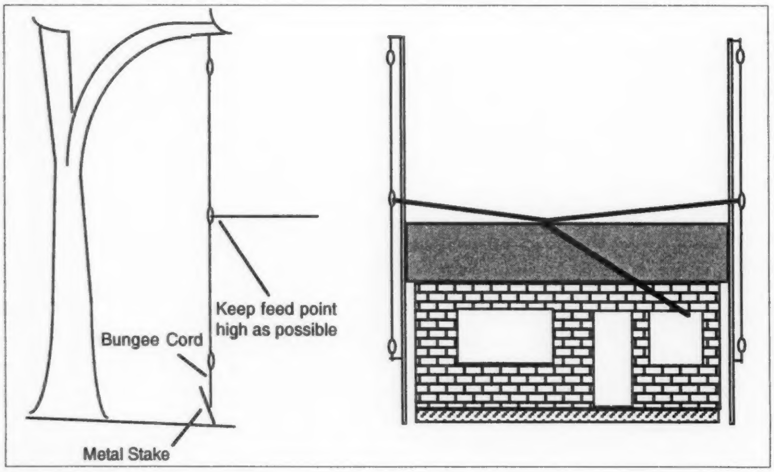
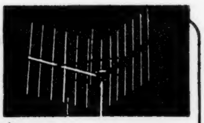

Keep feed point high as possible
Bungee Cord
Metal Stake

***Fig. 3**. Alternate configurations.*

Pico-J rolls up and hides in his 4-ounce pocket-sized holder, waiting like the Genie in a bottle till you need full-quieting signal pouch.
Call him forth and his glistening black weather sealed lines reveal a sleek end-fed halfwave antenna ready to hang anywhere. Suspend in the apartment closet or patio doorway. Attach **Pico-J** to window glass or curtain rod. He needs no radials for broadband low-angle omni halfwave gain.
Carry **Pico-J** with you for emergencies. Hang in the motel when on the road. He improves range, boosts reception, saves batteries.
Pico-J comes ready for work with 72" isolated coaxial feedline and gold pin BNC. Typical edge-to-edge SWR under 1.2:1. Hand-crafted in the U.S.A.
Pico J™
Info $1
Box 50062-D
Provo, UT
84605
Models
2 Meters
440MH
Dual Band add $6
Antennas West
Order Hotline
801-373-8425
19.95 ppd
CIRCLE 89 ON READER SERVICE CARD

QUICK, AND SIMPLE!!!
Flash cards NOVICE thru EXTRA theory. Key-words underlined. COMPACT - EASY Over 9000 sets used.
A card for each question!
NOVICE $11.95
TECHNICIAN $10.95
GENERAL $9.95
ADVANCED $19.95
EXTRA $14.45
Shipping 1 - $4.00
2 or more - $5.00
Call Today!
1-800-OKK-HAMS
VIS STUDY GUIDES
P.O. BOX 17377
HATTIESBURG, MS 39404
CIRCLE 104 ON READER SERVICE CARD



CornerBeam?
SWR < 1.2:1 across the band
Gain of a 15 ft Yagi
No dimension over 7 ft
40 dB Front-to Back Ratio
60° Half-power Beamwidth
Mounts directly to mast
Vertical or Horizontal Polarization
2meters $145, 220 MHz $145, 70 cm $115, Dual 146/440 $165
Weighs only 10 lbs. Add $11 Shipping & Handling. Info $1.
AntennasWest
Box 50062 Provo UT 84605
Order HotLine
801 373 8425
CIRCLE 380 ON READER SERVICE CARD

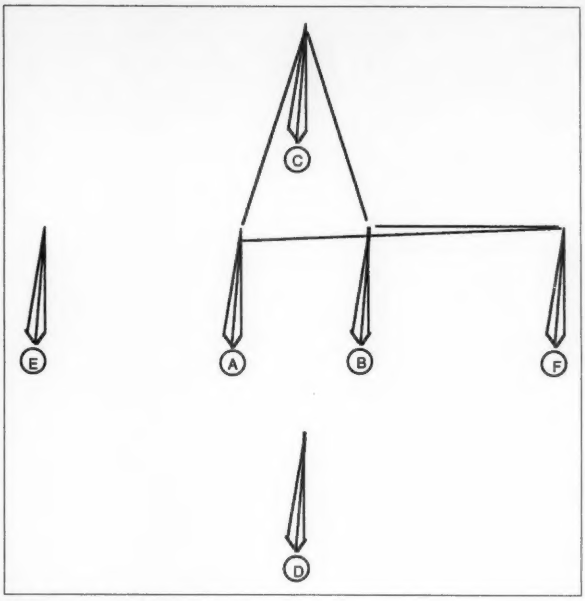


Fig. 5. Gain and directivity.

(out of phase) will lead to the correct current and phase match, regardless of the what the line length is.

The California Phased Array can deliver an honest 3 dB gain, and here's a simple explanation of how it does (see **Fig. 5**).

•Broadside (in phase) phasing: Antennas (A) and (B) are identical vertical dipoles separated by one half-wavelength and fed in phase. Receiving stations (C) and (D) are equally distant from antennas (A) and (B). The signals from (A) and (B) will, therefore, reach antennas (C) and (D) at the same time, in phase, and will add. However, receiving stations (E) and (F) will receive the radiated signals from antennas (A) and (B) 180° out of phase because the signal from the transmitting antenna that is farther away by one half-wavelength will arrive at the receiving antenna 180° out of phase, subtract and cancel out.

•Endfire (180° out of phase) phasing: The antennas are the same as above, but this time antennas (A) and (B) are fed 180° out of phase. In this case, since receiving stations (C) and (D) are equally distant from antennas (A) and (B), the signals will reach antennas (C) and (D) at the same time, but since the radiated signals are 180° out of phase, they will subtract and cancel out. However, in the case of receiving stations (E) and (F), the signal from one transmitting antenna is farther away by one half-wavelength and it will arrive at the receiving antenna 180° later than the closer one. This will put the signals back in phase and the signals will add.

It's so simple

There you have it: Gain and directivity with a simple wire antenna system—and all you need to rotate it electronically is a simple relay to switch an additional phasing line in and out.

The only thing critical about this antenna system is to be as precise as possible when preparing the dipoles and the feedlines. If a metal tower is used for support, the proximity of the tower will affect the characteristics of the dipole and distort the radiation pattern to some degree, but who knows? It may even improve performance. The original California Phased Array used RG-58U, because it's light and I never run over 100 watts. For high power usage RG-8 must be used.

Upon completion of the antenna system, I conducted its maiden test. While running 50 watts SSB, within a 35-minute period (I did a little rag-chewing) my first contacts included W1AW (CT) and KH6/W7GMH in Hawaii. This certainly demonstrated that the two major lobes were doing what they were supposed to do in the broadside configuration. A second test (also in the broadside configuration) was performed during the California QSO Contest (5 October 1996) and within an hour and a half, I worked 12 states and Canada (once again, 50 watts SSB). On-the-air testing is still underway in the endfire configuration (which is north and south from my San Francisco-area QTH). I'm sure hearing a lot of Spanish-speaking stations, so I guess I'll have to brush up on my Spanish! 73

AFFORDABLE
BOOM MIC. HEADSET
KIT: 44⁹⁵
ASSEMBLED: 64⁹⁵
State-of-the-art, noise-canceling electret Mic. with tailored response and large ear muffs reduce external noise. The Model TR-2000 is from an established aviation headset manufacturer. Prices plus S&H, less connectors. Connector-installed units available for many radios. We provide information to help you interface to nearly *any* radio. Credit card phone orders accepted.
MODEL TR-2000
CALL NOW-TOLL FREE
1-800-634-0094
30-DAY, MONEY-BACK GUARANTEE
WARREN GREGOIRE & ASSOCIATES
229 EL PUEBLO PLACE., CLAYTON, CA 94517, USA PHONE 510-673-9393
FAX 510-673-0538 E-MAIL INFO@WARRENGREGOIRE.COM
CIRCLE 350 ON READER SERVICE CARD

DSP AUDIO FILTERS: FINALLY HEAR WEAK SIGNALS - JPS IS BETTER than the competition, and less LESS EXPENSIVE. Let our 2 week Trial Full Satisfaction prove it!! NIR-12: $299.95, ANC-4 (phased local elect. noise elim.): $155.00, other JPS products. **ROPE ROPE ROPE**: ANTENNA/TOWER SUPPORTS: WHY RISK COSTLY FAILURES? Our DACRON rope is DOUBLE braided, $.06/.11/.16 for 3/32"; 3/16"; 5/16". 1,000 ft. discounts. "**FLEX-WEAVE**"™ hybrid, "Cadillac" aerial wire, 168 strand cop. bare and various color PVC. **WIRE/CABLE**: Commercial/ham/marine, insulators, baluns, "**BURY-FLEX**"™ low loss flex/bury cable $.59/ft avg.
DAVIS RF Co.
P.O. Box 730-C
Carlisle, MA 01741
DAVIS RF
24 Hour Orders:
1-800-328-4773
TECH/INFO:
1-508-369-1738
http://www.cqinternet.com/davisrf
(Commercial wire/cable please call our 800 #)
CIRCLE 189 ON READER SERVICE CARD

Shortwave Receivers
Past & Present
Communications Receivers 1945-1996
• New 2nd Ed.
• 80 Chapters
• 350 Pages
• 600 Photos
• Printed Jan.97
• Covers 1945 to 1996.
• 500 Receivers
• 400 Variants
• Includes 70 U.S. and Intl. manufacturers
• $19.95 (+$2 ship)
This huge 350 page Second Edition includes over 500 shortwave and amateur communications receivers made from 1945 to 1996. Here is everything you need to know as a radio collector or informed receiver buyer. Entry information includes: receiver type, date sold, photograph, size & weight, features, reviews, specifications, new & used values, variants, value rating and availability. Seventy American and worldwide manufacturers are represented. Become an instant receiver expert!
universal radio inc.
Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Orders: 800 431-3939
◆ Info: 614 866-4267
◆ FAX: 614 866-2339

Kindergarten, a Two-Wheeler, and a Ham License

It's fun, and very handy, to have more than one amateur radio operator in the family.

Peter A. Bergman N0BLX and
Chandra E. Bergman KB0YXB
3517 Estate Dr. SW
Brainerd MN 56401

My middle daughter Chandra, a/k/a "Shorty," has been wanting to be able to talk to me on the radio since she was two years old. Around Christmas 1995, after her sixth birthday, she said that she wanted to get her radio license so she could talk on the radio. That was an entirely different matter. She had been along and helped a bit during various public service activities, so she knew there is more to ham radio than being able to talk to people while they drive around. She had also expressed an interest in HF QRP. "Work the world on a watt," she says.

For those of you who are new to all this, getting an amateur radio license does require that the applicant pass some tests. Each of the six license levels carries with it a different level of privileges. At this time the no-code Technician license seems to be the entry point of choice to ham radio.

The Federal Communications Commission sets the standards and specifies what must be covered in the various tests. Fortunately, the FCC publishes a pool of test questions and answers from which the actual tests must be compiled, so there is no doubt about what must be studied for each class of license. Study guides containing the complete pool for the desired class are available from several sources.

I told Chandra that I would have to order a special book for her to study and that she would have to study every day. Then I waited a few days and she asked again, and again a few days after that. At that point it seemed she was still serious so I ordered Artsci's *Riding the Airwaves with Alpha and Zulu*. I chose that particular study guide because about half of the book is cartoons and illustrations which I hoped would help hold a young person's interest.

At least once a day I heard, "Dad, is the special book here yet?" Fortunately, the book arrived on January 9th, less than a week after it was ordered.

Since a completion certificate is provided for those elements passed at each test session and since the certificate is good for a full year, we decided on a simple strategy. We tackled one element at a time. There are tales of people walking in off the street and walking out with General class license, but I thought that would be a bit much for a six-year-old.

Chandra did pretty well in her studies. Sometimes it was hard to "stay on task" but we managed to have a study session almost every day, usually between supper and bedtime when we would normally have story time. Sometimes we had story time, too. Despite the fact that Chandra was only in kindergarten there were many, many distractions. One day she brought home the "Teddy" bag from school. Teddy had to be clothed appropriately, fed at regular times and a log book kept so she could tell the class how Teddy's visit to our home went. Teddy joined us for our study session that night.

I asked Shorty once if she had tried telling her schoolmates about ham radio and her studies. She said that she had but, "Dad, it takes an *hour* to explain it!"

Our original target date for her first test was the Fergus Falls hamfest on April 20th. But when she heard that I was going to the Fargo (North Dakota) hamfest on March 9th, she wanted to go along so she could try the test. Fortunately we had a friend along who could be the reader (responsible adult) with her in the test room. I did not want to be there because I was too deeply involved and I had a booth at the hamfest. I was afraid that I'd get both of us thrown out by prompting her. Besides, the VEs wouldn't let me.

Photo A. *Chandra Bergman KB0YXB, age 6, passed her Novice written test*—and *learned to ride a two-wheeler.*

During the test I was as nervous as a long-tailed cat in a room full of rocking chairs—but somehow I managed to keep my mind more or less on the booth.

No, she didn't make it. She got 20/30 and needed 22/30 to pass. But she came out of the experience determined to do better at Fergus Falls. Some of the things Dad had insisted she'd have to know actually showed up on the test. She got more serious at study time. Well, sort of. To help her with some of the facts she had to learn—like frequency assignments—we made little signs which we hung in various places around the house—the refrigerator door was our favorite spot.

The weeks between the Fargo hamfest on March 9th and the Fergus Falls (Minnesota) hamfest on April 20th seemed to go by awfully fast. All of a sudden it was 4:00 am, April 20th. We were on our way to Fergus Falls. I thought about going over some of the questions while I drove in the dark. Or getting Joe NØUME, our handiham buddy, to drill her a bit. Chandra had other plans—she went to sleep. We arrived early enough that we were able to join some friends for breakfast.

During breakfast I did ask some questions, both of Shorty and her friend Mike, who was also testing. She seemed to have her facts straight and rattled off answers between bites of food. One of the restaurant's other patrons that morning happened to be one of the Volunteer Examiners. He came over to visit with us for a few minutes and announced that a separate room would be set up for the kids so the reader and the kids wriggling wouldn't unnerve any of the other candidates.

Shorty was cool. We arrived at the fairgrounds, got the car unloaded, got Joe out of the car and into his chair and set up the booth. Chandra displayed her usual *joie de vivre*, both helping me and running all over the place with her friends.

Sharon KBØSQX, Shorty's reader, and her husband Jim KBØTXT arrived well before test time. Chandra had never met them but took an instant liking to them and seemed very relaxed with Sharon. Finally, they went in to test and after what seemed like a long, long time, they came back out with my daughter, as always, hyperactivating all over the place. An eon later we learned that she had passed the Novice written test with a respectable score. Everyone was pleased.

At this point, although we had not really spent any time on the Technician portion of the book, I asked her if she wanted to try the test anyway. Yes. They headed back to the testing area and I went back to trying to work my booth. Sometime later someone came out and told me that she had passed her test—I was thinking that not only would she want that new hand-held, but she'd probably want to drive home. Oops. Yes, she passed a test—the Novice written—Element 2. She got a 12/25 on the Technician written—Element 3A. Actually that wasn't bad, considering we had only flipped through that part of the book.

The Duluth/Superior hamfest loomed ahead. I had to get my booth supplies reorganized, and more study-time had to be spent—on evenings when the lengthening twilight called louder and louder to both of us. Friends to play with, bushes to plant, fish that needed catching, antenna projects, a two-wheeler to learn to ride. Nuts! Just two weeks between hamfests and testing sessions.

No, she didn't quite make it that time, either, but she just wouldn't quit despite a number of events—including a house fire—that would have discouraged a lot of people.

Finally, on the 4th of November, 1996, Chandra passed Element 3A and received her certificate. A few days later we learned that she had received callsign KBØYXB, and a few days after that she actually received her license in the mail—surely a big improvement over the long wait many of us have experienced in the past.

As I became more sanguine about Shorty's prospects I realized I would have to produce at least a two-meter rig that she could use. She was so confident of my ability to provide something that all her pop-can money had already been earmarked for a new bicycle. So I dusted off an old crystal-controlled rig that had been at the back of the shelf for a few years. After replacing one crystal, cleaning, and realigning, it looks like it should give her good service. By the time this article is in the mail she should be set up with the old rig, a borrowed power supply, and a flexi-j antenna at her mother's house.

In the meantime she has already used it in a minor emergency. The phones went out while she and her baby sister were here so she was able to call me while I was driving around at my day job. She relayed the correct phone numbers to me and I was able to make the call to get the phone repaired.

So what does it take to get a new ham in the family? An interested student, a willing teacher, a time and a place to study, and appropriate materials.

Was all the effort worthwhile? We think so. And it sure is handy to have another ham in the family. She is starting to talk about Element 1A—the code. When she passes that I guess it will be time for Dad to check the back of the shelf for an HF rig!

A note from Chandra KBØYXB: If you want to do good, you have got to study hard every day. If you do not pass a test, you have got to study more 'til you can pass the next time. It is like learning to ride a bike—you have to keep doing it 'til you do not need your training wheels anymore. 73s.

Riding The Airwaves with Alpha and Zulu is available from Artsci, Inc., PO Box 1428, Burbank CA 91507. Phone (818) 843-4080 or FAX (818) 846-2298.

Great Books!
Radio Monitoring
The How-To Guide
T.J. "Skip" Arey WB2GHA
NEW for 1997
The complete hands-on guide to the world of radio communication, including mediumwave, shortwave, VHF/UHF scanning, and more! This remarkable just-published book is the best scanning and monitoring manual available!
"This complete how-to guide should grace the shelf of anyone in the radio hobby." Richard D'Angelo, Chairman, Association of North American Radio Clubs
"Skip covers it all, from DC to daylight... A comprehensive course on intercepting and documenting radio signals. Highly recommended!" Bill Cheek
"The most complete and useful book of monitoring information available." Paul Swearingen, Publisher, DX News
A selection of the McGraw-Hill Electronics Book Club NEW
ISBN 1-56866-101-0 344 pages, $19.95
ULTIMATE SCANNER Scanner modifications 3 Bill Cheek 240 pp, large format, $29.95
By the master of scanner mods, Editor of World Scanning Report
SCANNERS & Secret Frequencies Henry Eisenson 320 pages, $19.95
"Must reading." Electronics Now "Useful, knowledgeable..." PopComm "A giant undertaking...authoritative" Monitoring Times
www.electriciti.com/~ipgbooks
INDEX Publishing Group, Inc.
3368 Governor Drive, Suite 273S
San Diego, CA 92122
s/h $4 1st book, then $2 ea, CA add tax
MO/check via mail, or MC, Visa, Amex
800-546-6707 (orders)
CIRCLE 174 ON READER SERVICE CARD

Next Day QSLs Two-Color Rainbow Assortment
Baraboo, Wisconsin Sauk County K9ZZ
Info $1
Antennas West (801) 373-8425

Call Today & We Ship	Next Day	2nd Day	ASAP
100	$29.95	$24.95	$19.95
200	$39.95	$34.95	$29.95
400	$49.95	$44.95	$39.95
500	$54.95	$49.95	$44.95
1000	$99.95	$89.95	$79.95

All orders ppd 2nd day air/ priority mail.
For overnight air delivery add $10.
Box 50062-S, Provo, UT 84605
CIRCLE 5 ON READER SERVICE CARD

Complete Relay System - Handie Talkie ready
Icom, Motorola, Yaesu ready
MasterCard, CertCheq, M.O. phone (204) 661-6859

XCVR
ANN
REP
Tx
Rx
OFF
AUX PTT
Simplex Repeater System

Burghardt's Amateur center 1-800-927-4261
Burghardt Amateur Sales 182 North Maple Watertown S.D.
Zip 57201-0073 Fax 1-605-886-3444
CIRCLE 224 ON READER SERVICE CARD

REPEATER HEADQUARTERS
Make "Commercial Quality" repeaters from GE and Motorola Mobiles
• 45 Watt VHF Micor from $99
• 40 Watt UHF Master II from $199
Conversion Information Available!
http://www.versatelcom.com
VersaTel COMMUNICATIONS
Orders: 800 456 5548
Info: 307 266 1700
FAX: 307 266 3010
CIRCLE 259 ON READER SERVICE CARD

Mini-Grid DXpedition to FM13

Sand, sun, & almost too much surf!

Robert "Greg" Robinson KB4NVD
208 Dogwood Acres
Hampton TN 37658

I had been wanting to go somewhere special to operate for a long time, and on the weekend of August 12, 1995, it finally happened. Mike N4OFA and I had been very busy at work and weren't sure that we would actually be able to go until the afternoon of the day before—but we were at last able to make it down to FM13 for a weekend of operating and sunshine. Why FM13? Well, this is a rather rare grid square to work because 95% of it is out on the water and the remaining 5% is loaded with mosquitoes!

We drove down to North Carolina Friday afternoon and found the closest campsite was about two miles into FM14. After ten hours of driving from east Tennessee we figured that was close enough. Mike was too keyed up to sleep after setting up the camper, so we drove on down to FM13 to scout the area for potential operating sites. We found a parking area at Fort Fisher State Recreation Area that looked good and gave it a try. There was a meteor shower that weekend, and we thought there would be more operators on, but after many unsuccessful CQs on 144.200 we gave up. We did see some pretty good shooting stars, though, before we headed back to the campground for some rest.

Saturday morning found us roasting inside the pop-up camper with the temperature in the high 90s and humidity to match, but we set up in time for the afternoon passes of RS-10. We found the parking lot packed full (not deserted like it was after midnight) and decided to operate right on the beach (there is four-wheel-drive access). "Hey Mike," I said. "This is why I really brought the Bronco!" Mike was a little skeptical but was willing to go along with it. We made it out a ways but got caught in one of the softer areas behind the dunes. We were almost too late for the first pass of RS-10, so we set up for it right on the spot. That pass netted three Qs.

After the pass, we relocated about 15 yards away, right over the dune next to the beach. I lowered the air pressure in the tires to give them a better footprint in the sand and drove around to the beach access. The dunes are very fragile and prone to erosion; no driving on them is permitted. Special crossovers are marked for access out onto the beach. Mike carried the 10m turnstile over and picked out a great spot. We set up all the equipment and took a swim to cool off—the heat index was over 110 degrees. We got out of the water in time for the next pass of RS-10 and worked four stations this time.

We got so caught up in operating that we stayed until 11 p.m., but were finally driven off the beach by hunger and thirst (I was drinking melted ice from the cooler and Mike actually ate part of an MRE I had brought). We made a fair number of Qs to the north, up into FM19

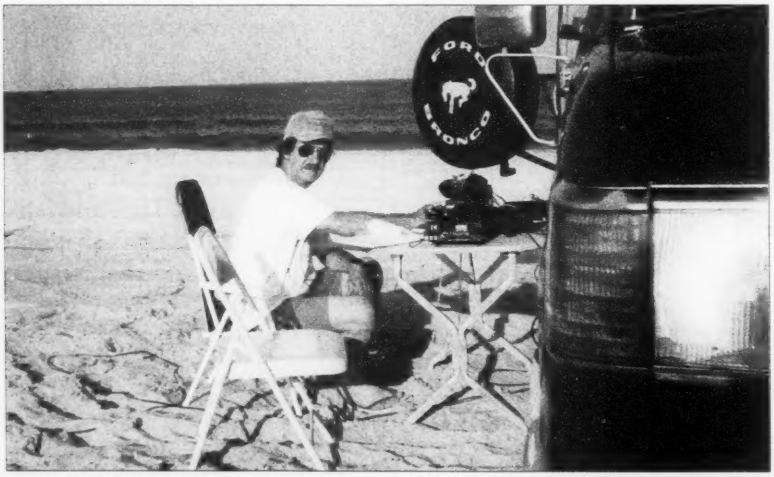


Photo A. *N4OFA on 2m CW.*

and such. To the east we completed a schedule with Carl AA4H (EM86) back home in east Tennessee. He had wanted to come along but decided he would rather work us while we were down there. Nothing was heard to the south.

Sunday, the heat index went over 115. We took the *big* cooler with us this time, and all the food. We called CQ for a long time before we had any takers, but once we'd worked a few, the word we were on spread quickly. We had a great opening into Florida as the evening wore on, and worked 29 stations.

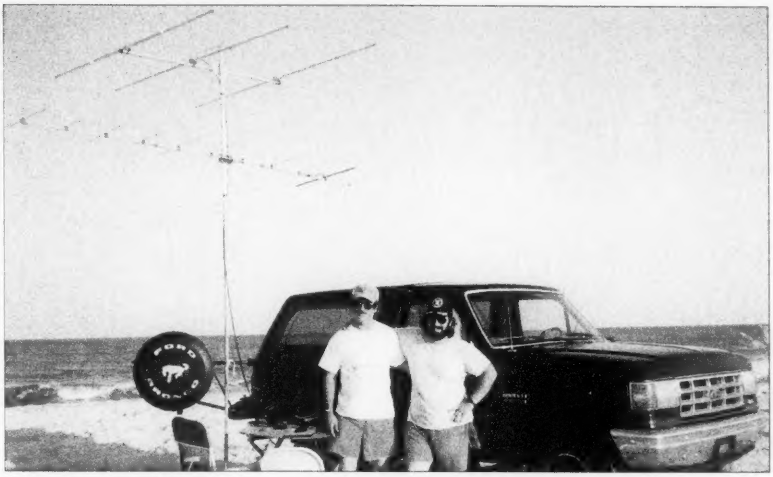


Photo C. *Mike N4OFA and Greg KB4NVD, portable in grid FM13.*

Murphy strikes again

EL98 seemed to be the center of the other end of the opening. After a long run of stations I finally had to have a break. Mike was going to do his CW magic and I was going to drink a gallon or two of water. I went around to the back of the truck where the cooler was and found the sand firm and moist. Hmm, this isn't right. Did Mike spill the cooler and not tell me? I went and got a flashlight, and holy cow! A wave had washed all the way up to and around the cooler. There was sea foam about ten feet from the truck. Murphy was here—using the name of Hurricane Felix. High tide was in and with the boost from the hurricane the waves were going to come up a *lot* higher than on the previous night. Right around the truck, it looked like.

I had visions of what the XYL was going to say: "You lost the Bronco but saved the *logs*?" Mike and I broke the station down in no time flat and were set to abandon the antenna. We moved the truck up away from the water and watched to see just how the waves were going. We decided that it would be OK to take the time to get the antenna and then get out of there. Mike walked ahead checking the progress of the water while I followed in the truck.

There was just a narrow strip left to drive on. When I got near the crossover I hit the horn and blasted off the beach without letting off the gas. Mike got out of the way pretty quick and caught up with me on the other side of the beach access. This was not a time to get stuck!

Mike and I had a great time operating from a rare grid and want to go back. We have identified some things to improve on, such as more power on 6m, and more bands. Also, the 10m rig had some problems that kept us from being effective on mode A. Being able to use headphones and control the volume (which was stuck wide open) would have been great.

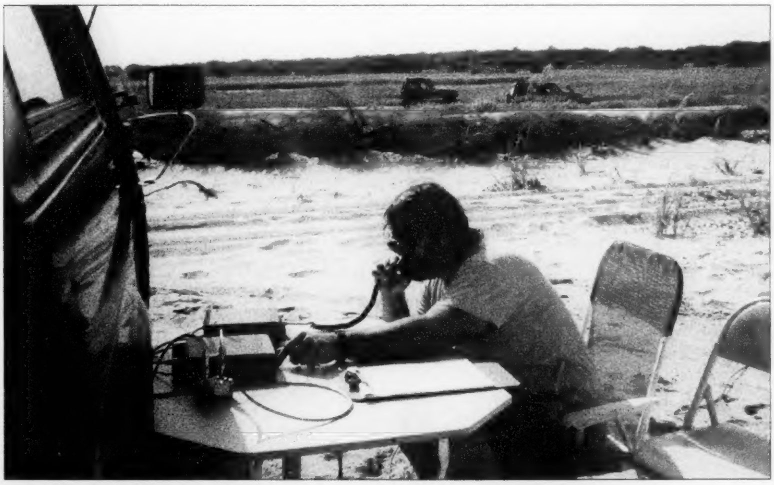


Photo B. *KB4NVD on RS-10.*

We may not have worked all that many stations, but the ones we did seemed pretty happy. For those in Florida who were wondering why we went off the air so abruptly, now you know why. The farthest station worked on 2m was Jordan WB2QLP in EL96, 538 miles away.

Many thanks to those who helped with equipment and spotting us on the various DX clusters.

The stats

Location: Grid FM13, Fort Fisher State Recreation Area, North Carolina

Operators: Mike N4OFA, Greg KB4NVD

Bands: 6m, 2m and mode A satellite

Equipment: Ten-Tec Scout w/ Ten-Tec 6m transverter; 3-el beam; Kenwood TR-751A; Mirage 160W brick; 10-el beam & Larsen 5/8-wave 2m mobile (uplink antenna for RS-10); HTX-100 10m (for mode A rx); turnstile

Pulling them in

- On 2 meters we worked 47 stations in grids EL88, 96, 97, 98, and 99; EM86, 90, 93 and 94; FM03, 05, 07, 08, 14, 15, 18 and 19.
- On 6 meters we worked 4 stations in grids EM94; FM03, 05.
- We worked 7 stations through the RS-10 satellite, and 2 stations through the RS-15 satellite.

Reprinted from The Satellite Operator, *December 1995.*

Limit Morse Code Testing to 5 Wpm

For any *class of amateur radio license.*

Guy A. Matzinger KB7PNQ
503 Dubois Street
Cheney WA 99004-1325
E-mail: guym@on-ramp.ior.com

Amateur radio is constantly referred to as a *hobby*, but it has regulations that are more severe than some professional organizations require for association. Why does a spare-time activity, pursued for pleasure or relaxation, insist that high-speed code proficiency must be demonstrated before a license is issued to use other modes and all the amateur spectrum? I believe these code requirements, with their subsequent marginalizing effect, are crippling the hobby.

The FCC acknowledges, in Form 610 (back page) "Notice to Physician," that five wpm is all that is required to meet International Regulations, but that the FCC supports 13 and 20 wpm code tests because the amateur radio service "strongly desires to preserve communications by telegraphy." How do high-speed code tests "preserve" CW? No one is advocating eliminating Morse code from amateur radio—and there is nothing in Part 97 that stipulates you must operate CW at any *standard* speed ... I wonder if I can convince the State Patrol I'm speeding in order to "preserve" my car?

While telegraphy may have been the dominant form of communication sixty years ago, today's interactive electronics have created a fundamental shift in the abilities and desires of amateur operators. Any organization that fails to recognize these changes, and dismisses or diminishes the technical advancements that are evolving around the world, is either naive or blind to mainstream concerns. Amateur radio must face the reality of tomorrow's technology, and the need to change or risk losing participation in the future.

The solution is politics and Congressional legislation. My goal is to collect 5,000 or more signatures of support for a petition to eliminate Morse code testing for *any* class of amateur radio license—or limit such tests to not more than 5 wpm. In order to obtain a fair hearing on this subject, I will personally take the petition before the Telecommunications Commission in Washington DC. In the meantime, I will continue to solicit the support of other legislators for this cause.

> ***"I wonder if I can convince the State Patrol I'm speeding in order to 'preserve' my car?"***

Radio spectrum is generally defined as the range of electromagnetic frequencies between three kilohertz and 300 gigahertz—and today is considered one of the nation's most valuable economic resources. The federal government determines the general uses for the radio spectrum, allocates bands of frequencies and then assigns licenses to specific users. However, this regulatory system has lent itself to abuse by special interests with the American public as the perennial loser. The case for reforming this failed regime is compelling, but it will take political action in Congress (or even the courts) to replace existing regulations. Most FCC processes are prone to delay—a result of good old-fashioned bureaucratic practices—and any attempt to correct this systemic problem is meet with further procrastination, equivocation and seemingly endless delay or even silence.

In 1927, Congress was persuaded to establish a "public interest" communications licensing scheme and in 1934 the Public Interest Standard was initiated so government would have a legal basis for controlling all licensing activities. The Public Interest Standard allowed regulators to engage in both industrial policy and political favoritism. Even today, the FCC does not have a definition for "public interest" and the "standard" (still in effect over 60 years later) is exactly whatever three of the five FCC members say it is. Nothing is ruled out.

The present amateur radio licensing structure is grounded on government-sanctioned policies designed to suppress participation. Complainants have continually criticized the inefficiencies and fundamental unfairness of such a system and with almost 90 percent of the US amateur radio community denied access to *all* of the amateur bands, efficient use of technological advancement is seriously impaired.

It is helpful to recall that in 1934 the telegraph was still the dominant form of communication and in the midst of the Great Depression, many amateur radio operators constructed their own equipment. The analog technologies of the day dictated the form and function of communications. Today, digital technique known as Code Division Multiple Access (CDMA) presents a massive wideband increase in efficient use of spectrum. Other compression techniques in spectrum management have opened up huge new segments of spectrum and the old approach of the government husbanding scarce spectrum and tightly regulating its use no longer has a valid basis.

The obsolete 1934 Act does not offer the flexibility or provisions to address the innovations and technical changes that are transforming social development globally. For over 60 years, the government's bureaucratic decision-making has been based on the assumption that communications technology would remain essentially static—an assumption untenable for the 21st century.

Whether today's technology becomes a dream of deliverance or a nightmare of disappointment often depends on what you expect. The information superhighway isn't a highway at all. It's a medium we're all in, all the time, and it gives us powers of information and communication we haven't begun to harness. Today's computer hardware and software tools give us the freedom and the ability to reach anyone or anything from anywhere at anytime. They will change the world in ways we can't imagine. And that's a good thing, even if those pickle-headed politicians, bureaucrats and some amateur radio organizations don't get it.

The "Infobahn" is taking to the airways as a host of wireless technologies mature. Utilizing the newest computer tool, live voice audio-conferencing over the Internet is now possible. The software cost is less than $100 and with a SLIP/PPP account, hourly on-line costs are less than three cents per hour (based on $20/mo and 8,760 hrs/yr) to anywhere in the world, anytime, day or night. A fiber in the fiber-optic network can simultaneously carry 37,500 separate conversations. The marginal cost of transmitting a call is literally zero. With these facts and considering the rapid removal of the sight barrier, how are you going to entice the younger generation into amateur radio in sufficient numbers to ensure the future of the hobby?

The truth is, you will never interest enough young people for this hobby to grow unless the Morse code requirement is either eliminated or limited to not more than 5 wpm for any class of license. Why should they be interested in an obsolete method of communicating when the technologies of the future challenge them? Presently, less than 5% of the total US amateur radio population is under 21 years of age. Unless this hobby is made more inviting to the youth of this country, the young will stay away.

A few years ago the IARU (International Amateur Radio Union) formed a CW Ad Hoc Committee to study the feasibility of maintaining or deleting RR2735, better known as the International Morse Code Regulation, which does not have a particular phraseology demand or definitive speed stipulation. The three members of the committee were from Great Britain, New Zealand and the US. The US representative was American Radio Relay League Exec. VP David Sumner K1ZZ. The results of their report were predictable—do nothing.

Apart from the question of whether the emotional ambiguities add up, there is something fallacious about this study. Is it the inclusion of a reference to the 1979 World Administrative Radio Conference (WARC-79) where the ARRL contended that its membership overwhelmingly requested "no change" to RR2735? Is this the reference (now more than 16 years old) constantly used by the FCC to reject all petitions that address Morse code testing practices? Or is it the admission, on page 17, that: "Standards will fall and the result could be congestion by technical-elite operators incapable of self-controlling their occupancy to achieve the best communicating results"—however, again, the "Standards" are never defined.

The statement on page 9 seems contradictory: "Yet it would be inappropriate to require, in an avocation (the dictionary defines avocation as a hobby) that all operators be capable of speaking and understanding a common spoken language"—yet they demand that everyone learn Morse code. Isn't communicating, regardless of method, speaking to others? Interesting admission on page 7: "With limited exceptions, radio amateurs today do not use Morse code to get important messages through under adverse conditions." They go on to say: "It must be remembered that many, if not most amateurs, use more than one

The Preferred Full/Half Duplex Autopatch

Use it like a cellular phone

An Affordable Autopatch packed with Incredible features!!!!

Requirements Only $109.00

1) Telephone line
2) 12v Power Supply
3) 2 dual band transceivers
4) A radio microphone connector that fits your transceiver

Automatic CW identifier

(The Autopatch will automatically send call signs in CW when activated)

Programmable time out function

(If you accidentally get out of range, the autopatch will time out and hang up the phone line.)

User selectable password

(Select personal password up to 9 digits to activate your autopatch)

Reverse patch

(If you choose so, it will page you when your phone rings)

Adjustable Volume

Easy Installation

Compact size 1"x3-3/8"x5/8"

Ultimate plus Pocket Morse Code Trainer

Learn code faster and easier
Better than code tapes
Take it anywhere to practice
Light weight and compact
Ideal for beginners to advance

*Selectable code rates 3-33 wpm
*User friendly menu
*Plays Standard and Farnsworth
*Plays continuous fresh random code
*Selectable random character playing
*Runs 30 hours on a 9 volt battery
*Size 2 3/8 X 4.5 x 1
*Continuous newly generated QSO (like the general exam)
*One year warranty

Only $69.99

Six Modes of Operation

1) Continuous Fresh Random Code
2) Test for Copying Random Code
3) Plays Continuous New QSO or Basically a Conversation Between Two People
4) Selectable Random Code
5) Interactive Code Training
6) Playing Random Words

Deluxe Plus Pocket Morse Code Trainers

Deluxe code trainer is like the Ultimate except no LCD display $44.99

Standard Plus

Standard code trainer is like the Deluxe except no internal speaker no selectable random code $29.99

Plus options and assessories available

Our Pocket Morse code Trainers have more power than most PC Morse code software programs, yet can still fit in your shirt pocket.

Visa/MC accepted Add $6 s/h +8.25% in TX

Computer Aided Technology,Inc.
4525 Production Drive, Dallas, Texas 75235
Phone: 214-350-0888

CIRCLE 276 ON READER SERVICE CARD

mode." Then why is a single mode with test speeds in excess of 5 wpm imposed on US amateurs? Doesn't this selectively limit participation?

New Zealand, with the support of Great Britain and others, proposed at WRC95 elimination of RR2735. The ARRL opposed the move and claims the US position was "in alignment" with their views.

Several years ago, the ARRL effectively lobbied and was primarily responsible for creating the present amateur licensing structure. It did so with but one thought in mind—self-serving exclusivity. This is the classic case of the minority controlling the majority with bureaucratic help. Keep in mind that the membership portion of US licensed amateurs in the ARRL organization is estimated to be *less than 25%* of the total US amateur community. Hardly majority representation of licensed amateurs.

Factoid: As of March 1995 the total ARRL membership is acknowledged at 172,752. Subtracting those who are not US licensed operators, the league's claim that they represent the majority of amateurs is estimated to fall 2 to 3 percentage points below 25% of the total number of 700,000+ US amateurs.

It appears to me that the chief concern of the ARRL board of directors should be how to extricate themselves from an egotistical blunder initiated several years ago by those in their organization whose sole purpose was to create an exclusive club and selectively limit participation in the hobby of amateur radio.

It's a shame the ARRL doesn't understand that their oppressive incentivized licensing policy and the torture associated with code testing is the major reason their own growth is limited. Their attitude reminds me of the Swiss watchmakers who, having invented the quartz watch, failed to pursue the technology—they went from 46% to 10% of the world market. In this technologically changing world, recognizing the need to change is essential for any organization that wishes to avoid obsolescence.

Nothing mandates that amateur radio operators, using CW, send code at a specified "standard" speed. Why then are 13 and 20 wpm code tests jammed down our throats? Code testing requirements are blunt powers that enable a minority organization to coerce the majority. It is estimated that less than 10% of the amateur community use manual telegraphy on any regular basis.

"The 'standard' is exactly whatever three of the five FCC members say it is."

Why are *all* petitions that propose any change to the Morse code testing syllabus rejected by the FCC? They continually trot out the same tired war-horse with the overused rationale that code requirements were developed with the desires of the amateur community—the who, when and why this occurred is never answered. Is this just a curious irrational coincidence or an intentional cabal—or are those who review petitions without a sense of moral responsibility?

Enough is enough of these politically generated self-serving policies. We need commonsense regulations, not government pandering to organizations who lack consideration for the opinions and rights of others. Maybe it's time these "bureaucratic cronies" and arrogant disciples of the ARRL retired?

Amateur radio is a hobby and is supposed to be fun for everyone, not just for a select few who consider HF bands their private domain in an exclusive club created by a licensing arrangement deliberately formulated to exclude the majority. If you are tired of the emotional cost, the endless frustration and the contemptuous attitude of those who support the present Morse code testing practices, you obviously no longer harbor the delusion that the code tests are for your benefit. For far too long, the majority of amateurs have been stymied, spurned and insulted, barred from total participation on all amateur bands by political favoritism initiated by a minority organization.

Current code testing practices no longer facilitate the society of amateur radio operators. Old ways may have been adequate years ago, but to survive into the future, amateur radio must face the reality of today's communications technology and be responsive to the innovations and ingenuity that even now is evolving around the world.

Reprinted from *The Code-5 Review*, published semi-annually by Guy Matzinger KB7PNQ.

NEVER SAY DIE

Continued from page 4

things which benefit all of us and for which, therefore, the hat should be passed for their development and maintenance.

In addition to military protection, a large contributor to our quality of life lies in developing and maintaining our industrial strength. Business. And here one obviously critical factor is the education and skills of our people. Our workforce. And this is every bit as important in the long run to our quality of life as the maintenance of our military strength. So yes, we need to pass the hat to pay for the education of our people. Note that I didn't limit that to children.

Once we graduate from our "free" public school system we are forced to pay for our own further education, so we make that investment because we see the potential for a personal benefit. But, in fact, everyone benefits to some degree, so perhaps it's reasonable to include some public contribution to further education.

Of course, one of the major problems with the government collecting for any service is the inefficiency of this funding system. Between administration, the natural application of Parkinson's Laws of growth to any government institution, and fraud, we're lucky to see 10 cents of any tax dollar collected end up where we intend it. There is plenty of room for improvement of this function of the government.

While it is in the interest of the public to keep government costs low, there is also an interest in educational efficiency which will permit the maximum transfer of information and skills to individuals at the lowest cost. And fighting all this is the momentum of the present bureaucracy which has gradually accumulated and solidified around the American school system, making it difficult to even consider major changes.

From what I heard during Economic Development Commission hearings from professional educators and college presidents, and what I've read as a result, I believe it's possible for our school costs to be cut at least in half—while, at the same time, we improve the product enormously. College tuition, using a plan I've proposed, can be eliminated entirely, with a concomitant reduction to three years and a resulting development of skills and information that's double to triple the current results.

Of course, with colleges, this would mean a reduction of their investment in paid sports teams and amenities such as golf courses and airports, the things which have driven the cost of some college "educations" over the $100,000 mark. The actual amount of education money buys is questionable, and not supported by international surveys.

Indeed, as I've pointed out in my *Making Money, A Beginner's Guide*, a college education equips you mainly for a job which will never make much money. Few successful entrepreneurs bother to finish college. Little that is taught (?) in today's colleges has any relevance to success in small business, and that's where the money is.

Building Skills

After reading Dan Greenberg's book, *Free At Last – The Sudbury Valley School*, I got all excited over what looked to me like possibly one of the best schools in the world. So I sent for, and read, five more books about the school. It's only a couple of hours from where I live, so I should get down there and see for myself what they're doing.

I love the idea of kids being able to learn what they want, without there being any formal curriculum: courses, grades, tests, and so on. In reading about the graduates I was struck by their success in a wide variety of fields, but I was disappointed that none that I read about were *outstandingly* successful. I expected to see some amazing successes.

I know you're not going to believe this, but this almost got me to thinking. The missing element, I suspect, is the taking advantage of children's natural curiosity by exposing them to a wide assortment of ideas as part of the plan, and not just hope that fate will do the job. Some of these kids might have a ball with amateur radio, if they knew about it. And ditto many other hobbies and interests.

When I was in the navy going to electronics school a submarine captain came in one time and gave us a talk about the submarine service. I had never considered it before that. So I volunteered for subs when graduation time came. I was disqualified on the medical, which is a fascinating story in itself, but I lied about it and went happily off to get myself killed in a 300-foot-long pipe.

In my *Declare War* book I proposed establishing a school much like the Sudbury Valley School, except that I wanted to have videos available for kids which would explain what the fun and benefits would be if they got involved with learning this or that subject, or developed some skills.

In my book I didn't list all of the skills I could think of, so this time I made a more comprehensive list of skills that I think would be of value for kids to build. Look over the list and let me know what I've missed.

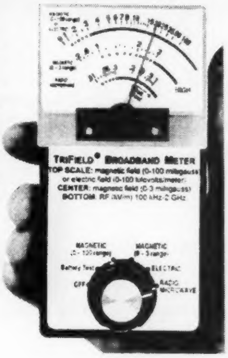
How many of these skills had you mastered by the time you got out of college? By "master" I really mean to be at least adequate at. Most of these skills require instruction from an expert. I've found that it doesn't take very long to get as good at some skill as the average person in the field. I generally like to take the extra time and effort to be better than 90% of the people with that interest. The next 9% takes ten times as much effort, so I generally don't bother. I like to be

Continued on page 47

ELECTROMAGNETIC MEASURING TOOL

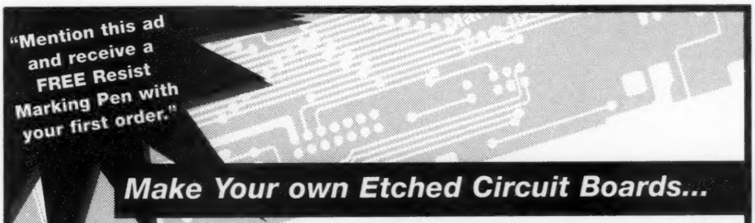
New TriField® Broadband Meter combines **a broadband field strength meter with an AC magnetic & electric field meter** in a single package. **RF field strength setting** (vertical, 10-1000 V/m @ 100 KHz -2.5 GHz) is ideal for making near-field transmitter measurements, finding RFI on a line, testing leaky microwave ovens or finding hidden surveillance "bugs". **AC magnetic setting** (0.2 -100 milligauss @ 60 Hz, range 50 Hz -100 KHz, full 3-axis magnitude) tests for magnetic interference (a sometimes nasty but difficult-to-pin-down problem with sensitive equipment), tells you which of several lines is carrying AC or pulsed current, finds underground power lines, tells you if a power supply or transformer is "on", without contact. **AC electric field setting** (0.5 -100 KV/m @ 60 Hz, range 50 Hz -100 KHz) tells you which line is "hot" vs. "neutral", finds AC wiring in walls, and determines whether equipment is properly grounded.

Includes standard 9-Volt battery, 1 year warranty. Price $170 includes delivery in US , Canada. **Also available: low cost digital DC magnetic & electrostatic field meters, air ion counters. Call for free catalog.**
All meters made in USA by AlphaLab, Inc. / 1280 South 300 West /
SALT LAKE CITY UT 84101. Tel. 800-769-3754 or 801-487-9492.
Major credit cards accepted.



The NiCad Lady - N6WPA
Losing your source of power?
Have your old case refitted with NEW cells and $ave!
Convert your pack to NiMH!
Same size pack — HIGHER capacity!
***Handhelds *LapTops *Commercial Radios *Camcorders**
***Portable Scanners *Test Equipment *Power Tools**
***Any Special Application**
NEW replacement packs & Individual cells also available!
Call for a price list!
17052 Alameda Drive Perris, CA 92570
(909) 789-0830 FAX (909) 789-4895

CIRCLE 141 ON READER SERVICE CARD


"Mention this ad and receive a FREE Resist Marking Pen with your first order."

Make Your own Etched Circuit Boards...

With Kepro!

To make your own prototype printed circuit boards, call Kepro - for your **FREE** "How to Make a Printed Circuit Board" booklet.

For our catalog of products and services, or our easy step-by-step "How To" booklet, call:

800-325-3878

kepro
Kepro Circuit Systems, Inc.

Kepro Circuit Systems, Inc.
314-343-1630 in St. Louis

630 Axminister Drive
800-325-3878

Fenton, MO 63026-2992
FAX 314-343-0668

CIRCLE 341 ON READER SERVICE CARD

Hamtronics' TA-51 Exciter Kit

Perk up your foxhunts with this project.

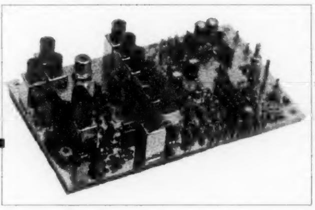


Photo A. *The assembled TA-51 exciter board.*

Larry Antonuk WB9RRT
P.O. Box 452
Marlborough NH 03455

Over the last couple of years our small foxhunting group had been growing by leaps and bounds. Starting with just a couple of experimenters, our group now numbered over a dozen. We all enjoyed the thrill of the chase, but the main focus of the group was building, testing, and experimenting with new antenna and RDF (radio direction finding) designs.

Hunt troubles

Things had been going well in general, but over the last few hunts we'd had problems. Three of the last five hunts had to be called off or modified because our fox transmitters had failed during the hunts. In one case we were using an old thumbwheel-type handheld as the fox. Apparently the thumbwheel contacts were dirty, causing the transmitter to jump channels intermittently. This made the transmitter mysteriously drop off the air at strange intervals, and caused some trouble for the packet channel the rig was suddenly transmitting on. One of the group then built up a little postage stamp-sized transmitter. This worked OK, but the frequency began to drift as the battery voltage dropped. The hunters with the synthesized rigs were able to follow the transmitter down the band, but those of us with rock-bound rigs were left on the wayside. As a last resort, one of the guys donated an old mobile rig, matched up with a car battery. It was still putting out about twenty watts, so he hid the high-power fox in the next county, using a timer to turn it on right at noon after he returned to the starting point. It was a great idea, but the second time the rig keyed up the high amount of RF got into the IDer/timer, locking it up and causing the rig to go into constant PTT. This made for easy hunting, but after about half an hour the finals burned up—turning our high-power mobile into a QRP rig.

> ***"(Before the TA-51)... our frustration level was running high..."***

At this point our frustration level was running high. We were spending more time fixing our crippled foxes than we were building antennas. At our next informal meeting we came to the obvious conclusion—we needed a decent fox. Of course, no one stepped forward to donate a new handheld. No one wanted anything to do with the flea-power one-transistor boards. A few mobile rigs were offered, but they were too big to mess around with. We ticked off the requirements. The transmitter had to have between one and five watts output for the best use around our area. It needed to be rugged—continuous duty, just in case we had another controller failure. Crystal control was OK, since we always used the same channel for the hunt. And of course, it needed to be reasonably priced (OK, cheap or free would be best).

Enter Hamtronics

One member of the group, who works for a commercial two-way outfit, mentioned the use of a Hamtronics exciter. His company had used several of the exciter boards as fixed transmitters in RF link applications. They were continuous duty at two watts, and met all of our requirements at a decent price. At our next weekly breakfast he

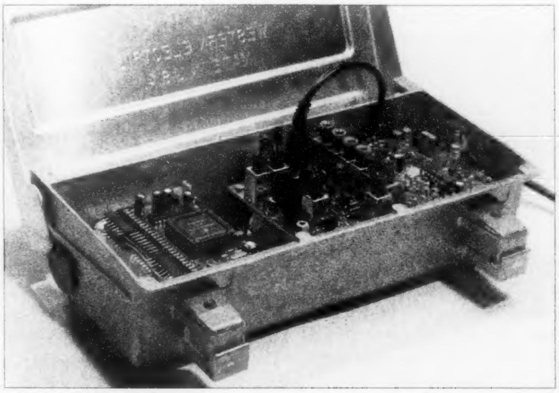


Photo B. *The TA-51 shown mounted in a surplus telephone company connection box. The exciter board sits atop the battery pack, with the ADAPT-11 microcontroller mounted in the front of the box.*

brought in his catalog, and we chose the TA-51. The TA-51 was the companion transmitter to the R-100 receiver (see *73*, February 1996) designed for repeater or RF link applications. We passed the hat for contributions, and anxiously sent off the check to Hamtronics.

The unit was shipped directly to our resident kit fanatic, so the rest of the group never saw the exciter in unassembled form. It was proudly displayed at the following breakfast—assembled, tuned, and tested. According to the report, the assembly went without a hitch. In appearance the TA-51 looks very similar to the R-100: the same glass-epoxy PC board, the high-quality components, the easy-to-tune coils. The TA-51 uses eight transistors in the RF section, and a single op amp IC for audio processing. Our RF wizard had a service monitor for tune-up, but indicated that standard equipment would make it just about as easy—a voltmeter, a dummy load/wattmeter, and a current reading power supply. The A28 tuning tool is mandatory; there's no other way to adjust those slugs with the square holes. One other point that was appreciated by the builder and the group was the use of a high-quality, ten-turn piston cap for warping the crystal. This made it a cinch to adjust the transmitter frequency right on, as opposed to the single-turn caps we'd been used to on the handhelds and mobile rigs (in addition to being tricky to adjust, the single-turn caps were very susceptible to jarring and bumping—one drop of the fox, and we were off on another channel).

> ***"No problems—even after that ten-foot drop..."***

Once it was built and aligned, we took an evening and installed the TA-51 in our fox "cabinet," a surplus telephone company connection box. The box was waterproof, easy to mount or hide, and just the right size for a small handheld or the TA-51, along with the IDer and a large NiCd battery.

New IDer, too

The IDer itself was something of a home-brew device. It was built using the ADAPT-11, a 68HC11-based microcontroller, and programmed to key up the transmitter and send Morse IDs. The transmitter was keyed by toggling one of the 68HC11 output ports, and the audio tones were created by toggling an output port at 1000 Hz, then keying this on and off to create the dots and dashes. Our resident computer guru set up the ADAPT-11 to create a pseudo-random PTT time, so the hunters were never quite sure when the signal would pop up, or how long it would last. In addition to the timing challenges, our guru found that you can vary the power output of the TA-51 by simply dropping the B+ voltage down to 11 volts. His next plan is to raise and lower the output power of the TA-51 intermittently, in order to further confuse the hunters. Once mounted in the telephone company box, the fox is easily hidden or, as in one case, not hidden at all. Mounted at the ten-foot level on a telephone pole, the box fit in so well that most hunters passed by or circled the pole several times before identifying the fox.

While exhaustive field tests are not yet complete, the new TA-51 fox has participated in three hunts with no problems—even after the ten-foot drop from that telephone pole on hunt number two. Perhaps the best measure of success is the fact that the topic of our weekly breakfast discussion is now turning back to how to make better antennas and RDF rigs, rather than how to get a fox we can rely on!

The TA-51 VHF Exciter kit is available for $99.00 from Hamtronics, Inc., 65 Moul Road, Hilton NY 14468-9535. Phone: (716) 392-9430.

Amplifiers, ATV Down Converters & Hard to Find Parts

LINEAR AMPLIFIERS

HF Amplifiers
PC board and complete parts list for HF amplifiers described in the **Motorola Application Notes and Engineering Bulletins:**

AN779H (20W)
AN779L (20W)
AN 762 (140W)
EB63 (140W)
AR305 (300W)
AN 758 (300W)
AR313 (300W)
EB27A (300W)
EB104 (600W)
AR347 (1000W)

2 Meter Amplifiers (144-148 MHz)
(Kit or Wired and Tested)
35W - Model 335A, $79.95/$109.95
75W - Model 875A, $119.95/$159.95

440-450 MHz Amplifiers
(SSB-FM-ATV)
100W - Model KEB 67, $159.95

ATV Down Converters
(Kit or Wired and Tested)
Model ATV-3 (420-450)
(Ga AS - FET)
$49.95/$69.95
Model ATV-4 (902-926)
(GaAS - FET)
$59.95/$79.95

HARD TO FIND PARTS
- **RF Power Transistors**
- **Broadband HF Transformers**
- **Chip Caps** - Kemet/ATC
- **Metalclad Mica Caps** - Unelco/Semco
- **ARCO/SPRAGUE** Trimmer Capacitors

We can get you virtually any RF transistor!
Call us for "strange" hard to find parts!

DIGITAL FREQUENCY READOUT
For older analog transceivers
TK-1 (Wired and Tested)$149.95

For detailed information and prices, call or write for a our free catalog!

ADDITIONAL ITEMS
Heat Sink Material
Model 99 Heat Sink (6.5" x 12" x 1.6"), $24.00
CHS-8 Copper Spreader (8 "x 6" x 3/8"), $24.00
Low Pass Filters (up to 300W) for harmonics
Specify 10M, 15M, 20M, 40M, 80M or 160M
HF Splitters and Combiners up to 2KW

Add $4.50 for shipping and handling

VISA

CCI Communication Concepts Inc.
508 Millstone Drive • Beavercreek, Ohio 45434-5840
Phone: (937)426-8600 • Fax (937)429-3811
E Mail: cci.dayton@pobox.com

CIRCLE 99 ON READER SERVICE CARD

Smart Battery Charger

JUN 87 QST
BY WARREN DION N1BBH

FOR GEL-CELLS or LEAD ACID BATTERIES.
Features: Precision temperature tracking voltage reference & three mode charging sequence. Standard kit is for 12V @ 1/2 or 1 Amp, user selectable. Can be connected to the battery indefinately, will not overcharge. Weighs 2 pounds and measures 4"W x 5½"D x 2½"H. Finished enclosure included in kit.

Complete Kit Only $59.95
Assembled & Tested $79.95

CA Residents add 7.75% sales tax. S&H: $5.00 (insured). Foreign orders add 20%. For more info or price list; send legal size SASE (55¢) to:

MasterCard **A&A Engineering** VISA
2521 W. La Palma #K · Anaheim, CA 92801
(714) 952-2114 · FAX: (714) 952-3280

TNT *Today's No-Tune Multiband Antenna*

No pruning. No tuning. No knobs to twist.
TNT is No-Tune on 80 cw, 40, 20, 17, 12, 10. TNT/2 is No-tune on 40, 20, 10. Work other bands w/ tuner. DX &Gain rise w/ frequency.

Ready to Use
Includes isolation balun & 99 ft RG8x

Kink-Proof
Wx-Sealed
Low Noise

No Traps or Resistors
Insulated to 3000 V
Rated 500 Watts

The modern coax-fed version of the classic off-center fed windom.

TNT Windom **$89.95** +$8 P&H 135 ft. long
TNT/2 Windom **$79.95** +$7 P&H 67 ft. long

Technote 126--$6.95 ppd
AntennasWest
Box 50062S, Provo, UT 84605

Order Hotline **800-926-7373**

CIRCLE 135 ON READER SERVICE CARD

From Micro Computer Concepts **RC-1000 REPEATER CONTROLLER**

- **Autopatch** • **Reverse Autopatch**
- **User Programmable CW ID, Control & User Codes & Timeouts**

Manual with schematics • 90-Day Warranty
Wired & Tested w/ manual **$199.95**

VISA MasterCard
Micro Computer Concepts
8849 Gum Tree Ave.
New Port Richey, FL 34653
813-376-6575

CIRCLE 160 ON READER SERVICE CARD

Number 42 on your Feedback card

Small Loop Design for HF QRP

A practical approach.

Jay M. Jeffery WV8R
3819 Parkdale Road
Cleveland Heights OH 44121

It's nice to be able to make perfect small loops using metal tubing and motorized split stator capacitors, and to be able to weld everything neatly together, but not everyone wants or needs such elaborate antennas. In fact, for QRP operation, the weight and complexity of the very efficient loops is often not desirable. A wire loop, on the other hand, is a light, simple, device that can be built quickly and easily and can be repaired with a few basic tools. It needs only an ordinary variable capacitor, and it's easy to take in the car.

For the QRPer in an apartment, a manually-tuned wire loop hidden behind a wardrobe is more appropriate than a heavy monstrosity that must be operated by means of a control box even though the antenna is only a few feet away. Also, a wire antenna can be put together for just a few dollars—even less if you have a junk box and some leftover furring strips.

It works both ways

To design and build small wire loop antennas, I had to come up with a quick, easy way to estimate the inductance of a wire loop where the length is known. On the other hand, if a specific inductance value is known, the required length would be easy to calculate using the same formula. The range of the formula would have to include loops with a circumference of seven feet to 38 feet. In this range, "small" loops are still small relative to the size of a room or an attic space. Of course, 38 feet may be hard to accommodate, but it is still possible.

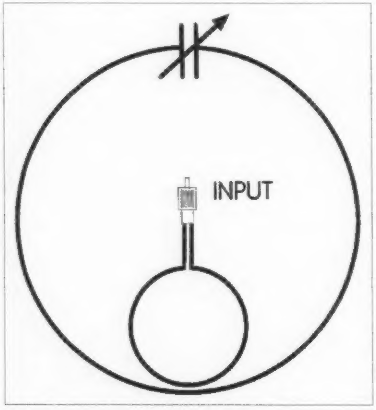


Fig. 1. Circuit diagram.

The simplified formula is a linear approximation of a more complicated formula which can be found in *The ARRL Antenna Handbook*. The more complete formula (slightly modified) is:

$$L = .019S\ (7.353\ \log_{10} \frac{96S}{\pi D} - 6.386)$$

where S is the perimeter of the loop in feet, D is the diameter of the wire used in inches, and L is inductance in µH. This formula can be used for values outside the range given for the shortcut formula.

The simplified formula is L=.45S - .5, where L is the inductance in µH and S is the perimeter in feet. Solving for S in terms of L, we get S=2.22L + 1.11. These formulas are approximate but easy, and close enough for practical use. They assume an AWG #12 wire size but would work for wire slightly larger or smaller. The wire recommended for this purpose is #12 stranded, insulated house wire, cheap and readily available.

More numbers

Given the size of a loop and a capacitance value, the inductance can be calculated for a particular band, or for several bands using the extreme frequencies, L=.45S - .5 and the formula:

$$f = \frac{10^6}{2\pi\sqrt{LC}}$$

where *f* is the frequency in kHz, L is the inductance in µH, and C is the capacitance in pF. Some useful versions of this basic formula are the following:

$$C = (\frac{10^6}{2\pi f\sqrt{L}})^2$$

$$L = (\frac{10^6}{2\pi f\sqrt{C}})^2$$

The formula that solves for L is appropriate when you have a good variable capacitor and want to determine what size of loop you need for certain frequencies. You simply substitute the L value in the length formula (S=2.22L + 1.11).

Beside the formulas, some rules of thumb are helpful in making small loops. The size of the loop should be large enough to be relatively efficient and large enough to tune easily. For easy tuning, you don't want to be tuning at the extreme values of the capacitor. For efficiency, experience has taught me that a 10-20 meter loop works well if its length is no smaller than seven feet. A 20-40 meter loop should be no smaller than 11 feet. A 30-80 meter loop should be no smaller than 22 feet. For indoor use, a vertical loop is the best choice.

Impedance matching

Small loops require an impedance matching device. The simplest approach is a small input loop placed inside and very near the main loop (**Fig. 1**). In practice, using insulated wire, the lower part of the input loop can be taped to the bottom of the main loop. This allows for fairly close coupling and for added mechanical rigidity. The coax is attached to the input loop and is placed so that it comes away from the plane of the main loop at a right angle. The input loop should be about one-fifth the size of the main loop or smaller, but experiment for your own best results.

Try a project

To show the use of the previous information, let's design a 20 through 40 meter loop for use in an apartment, a home, or even outdoors (an outdoor antenna would require weatherproofing, however).

Assuming that you have an eight through 100 pF air variable capacitor available, the required inductance can be calculated using:

$$L = \left(\frac{10^6}{2\pi f\sqrt{C}}\right)^2$$

Using the lowest frequency to be used (7,000 kHz) and somewhat less than maximum capacitance (say, 90 pF), the inductance turns out to be around 5.74 µH. Using S=2.22L + 1.11, the length is approximately 13.9 feet or about 167 inches. This would be a square approximately 41.7 inches on each side. A circular loop, using D=C/π, would have a diameter of about 53 inches.

At the higher end of the frequency range, C=18 pF (somewhat more than the absolute minimum). Then, using the formula for f, specifically,

$$f = \frac{10^6}{2\pi\sqrt{LC}}$$

we come up with 15,700 kHz. This means that the antenna should easily accommodate 20 through 40 meters.

Finally, the input loop length is 167/5 inches or about 33.4 inches.

Testing the loop

First, the wire for the two loops should be cut to the calculated lengths and laid out on a wooden floor (or somewhere that won't involve a lot of metal mass). Temporarily mount the variable capacitor in a plastic box or the like and connect it to the main loop. Connect some 50 ohm coax to the input loop and place the loop very close to the main loop.

Now, connect the plug of the coax to a receiver set first at 7,000 kHz. By adjusting the loop capacitor, you should be able to find resonance points. If you have resonance, the background noise will maximize and signals should be easily heard on the band. Note that the resonance points are sharply defined, so tune slowly. If the loop doesn't tune the band, pruning or adding some length should fix it depending on which band is missing. Repeat this procedure for the highest frequency desired—in this case the top of the 20 meter band. If the SWR is too high, try pruning the input loop.

If the size of the loop is satisfactory, then you can design a framework to hold it. Almost any polygon will do, although a circle or an ellipse can be managed by using solid house wire, #12 or larger, which will hold a curved shape. A single mast can support the loop, but a spreader will make it more rigid.

If you think this particular loop is too large, get a larger capacity variable and design another loop to fit it.

Another approach

Another way is to begin with the size of the loop you prefer. Knowing the size, you can compute the approximate inductance. With the inductance and the frequencies, you can determine the size of the variable capacitor you need. There are variable capacitors available from several places including Surplus Sales of Nebraska, Mouser, Ocean State, or Antique Electronic Supply. Ocean State Electronics has some excellent trimmers that can be used. Trimmers give you a wide choice of capacitance ranges and breakdown voltages, and they are harder to tune, even with an alignment tool—but they *are* relatively cheap.

Capacitors obtained from an old tuner work well as long as the power levels don't exceed 10 or 15 watts. Capacitors with higher breakdown voltages are required for QRO.

Don't make the loop too small!

I recommend (from experience) that loops should be 8% of the wavelength of the lowest frequency you intend to use or more. About an eighth of a wavelength is better, but the antenna gets rather large, especially for 80 or 160 meters.

Finally, here is a warning: Don't forget that an antenna should not be touched while it is in operation. Even at low power levels, not to mention high ones, there is danger. Please take safety precautions. A loop sitting on the floor in your house is very accessible to pets and people.

On your own

You have enough information now to design, test and build your own small loop antennas—the best way to learn about them. This way you can get exactly the kind of small antenna you want. 73

The Original

"Chassis Handler"

A patented adjustable support stand for antique radio, ham, and hi fi repair. Maneuverable on casters, it features adjustable work height, chassis width (to 28"), and chassis inversion. Large enough to handle Scott radio or Fender amp Chassis. 35 lb sh.

$149.00 plus UPS
The Tech Shack-- 1645 W 5th Street
Washington, NC 27889
Ph (919) 975-2677 or (919) 943-5253
Mastercard, Visa, COD, Check

CIRCLE 146 ON READER SERVICE CARD

FREE CONSTRUCTOR'S CATALOG!

RF Shielded Steel Boxes

MODEL	W x D x H in.	A*	B**
SB-1	2.1 x 1.9 x 1.0	4.65	5.50
SB-2	3.3 x 1.9 x 1.0	6.25	7.50
SB-3	4.2 x 1.9 x 1.0	9.50	11.25
SB-4	6.3 x 1.9 x 1.0	11.00	12.50
SB-5	3.3 x 2.7 x 1.1	9.75	11.50
SB-6	4.8 x 2.7 x 1.1	12.00	14.25
SB-7	6.4 x 2.7 x 1.1	13.75	16.25
SB-8	2.6 x 2.7 x .63	7.25	8.75
SB-9	3.2 x 2.7 x .63	8.50	10.00
SB-10	4.8 x 2.7 x .63	9.25	11.00
SB-11	6.3 x 2.7 x .63	11.25	13.25
FEED-THRU CAPACITORS			
FTS-1	1000pF/50VDC SOLDER	.88	.95
FTSH-1	1000pF/50VDC SCREW-IN	3.60	3.75

VISA

HOT TIN-PLATED STEEL BOXES WITH DIVIDERS; ELIMINATE SPILLOVER OF UNWANTED SIGNALS!
FEED-THRU CAPACITORS, TOO!
*MUST MENTION AD FOR DISCOUNT

ORDER TODAY! (\$30.00 MINIMUM ORDER)
PRICES INCLUDE WORLDWIDE SHIPPING!
*A = Cont. U.S., CANADA & MEXICO; **B = Rest of WORLD

SESCOM ®
ORDERS 800-634-3457 ■ FAX 800-551-2749
OFFICE 702-565-3400 ■ FAX 702-565-4828
SESCOM, INC. 2100 WARD DR., HENDERSON, NV 89015
SESCOM, INC. is not responsible for inadvertent typographical errors and prices and specifications are subject to change without notice.

CIRCLE 167 ON READER SERVICE CARD

PkGOLD & KaGOLD
Packet Radio and Much More
Amtor - Pactor - Gtor - Rtty
Compare these Advanced Features !!

*Join Thousands of **GOLD** Users Worldwide*
More Features , More Users, More Fun !!
InterFlex Systems Design Corp.
P.O. Box 6418, Laguna Niguel, CA 92607-6418

***KaGOLD** for Kantronics* | ***PkGOLD** for AEA tncs*
Packet Pactor G-tor Amtor Baudot Navtex

- Supports latest ROM
- Binary File Transfers
- Conference Mode
- ANSI Graphics
- Remote Commands
- Dual Port Support
- Multi-Connects Easy
- Logging built-in
- Callbook Access
- Full On-line Help
- Fast Native Code
- Smooth operation in Win 3.xx, 95, NT
- Printed User Guide
- Don't Miss Out !
- Call Today to Inquire

Order/Info/Help (714) 496-6639

We're on the WEB !!!
http://www.interflex.com

CIRCLE 77 ON READER SERVICE CARD

Power Monitor/Distribution Panel

Build this early warning system.

J. Frank Brumbaugh KB4ZGC/W4LJD
Box 30 - c/o Defendini
Salinas PR 00751

Very few station power supplies or transceivers are equipped with meters to monitor voltage and current, yet knowing the level of both is important and often provides the first warning that something is wrong. Of course, omitting these meters reduces the cost and size of power supplies, many of which will be tucked out of sight under the operating desk or on a high shelf and seldom glanced at after being turned on. Also, as we all know, the front panel of the usual commercial transceiver teems with so many knobs, switches, and push-buttons that there's no room for these useful voltage and current meters. Omitting them also reduces manufacturing costs.

Every ham should know whether the regulated voltage from the power supply is steady and at the correct level. An unusual variation is a warning and should be investigated immediately.

Murphy's Law being what it is, occasionally the power supply regulator can quit, allowing the output voltage to soar to dangerous levels. Although some commercial power supplies contain protective circuits to prevent this, some do not. Also, many home-brewed regulated power supplies may not be protected from the results of regulator failure at all. Therefore, to protect your transceiver as well as your bank account from major damage, this panel includes a means of monitoring the DC voltage and automatically disconnecting it from the transceiver should the voltage exceed a safe pre-set level. A fuse alone would not open the circuit rapidly enough to prevent damage, although a fuse should be included in the positive DC lead.

Because many ham and/or satellite stations have more than one transceiver as well as many other pieces of equipment, separate parallel branches should be available to distribute DC voltage to all present and planned equipment to be powered from the main station power supply. Additional "goodies" can easily be incorporated, such as regulated low voltages to power accessory equipment.

The panel described here provides all the amenities described above. It can often be constructed entirely from a well stocked junk box, but for those few who lack a well filled one, I'll tell you where to purchase the most expensive components, the meters, for little more than pocket change. Except for the panel itself, which can be a flat panel, an aluminum chassis, or a home-brewed enclosure, the total parts cost should not exceed ten dollars. This is very inexpensive insurance for expensive equipment which also provides maximum flexibility in monitoring and routing DC operating voltage to your equipment.

The circuit

Fig. 1 illustrates the schematic diagram of this panel. Aside from its primary functions of monitoring, distributing, and automatically disconnecting power from the load(s), should the voltage soar out of bounds, it includes optional but very handy outputs at the three most useful regulated voltages often needed for accessories but not directly available from the station power supply.

Regulated DC voltage from the station power supply is applied to the positive and negative input terminals of J1. A barrier strip is shown, but separate DC input and output connectors can be used to replace the barrier strip and eliminate the exposed voltage terminals. This input voltage is bypassed where it enters the panel by capacitors C1, C2, and C3, which eliminate incidental noise or spikes generated externally or internally. Positive voltage from J1 passes through fuse F1 and the normally-closed contacts of relay K1, then through current shunt R2 which is in parallel with ammeter M1, to the power output terminals on J1. Negative (ground) terminals on J1 and all grounds in the panel are connected to the station ground. Output terminals for three distribution lines are shown. You may install however many you wish. Meter M1 will display the total current drawn by loads connected to the output terminals when they are turned on. Positive voltage at the output of the shunt R2 is also applied to the suppressed-zero, expanded-scale voltmeter M2. This meter indicates a narrow range of voltages around the nominal power supply voltage as chosen by the builder. This will be explained later.

The input DC voltage is also tapped off between fuse F1 and the moving contact of relay K1 and applied to the automatic voltage monitoring circuit consisting of R1, D3, Q1, and K2. When R1 has been properly adjusted and the DC voltage exceeds the level chosen by the builder, D2 avalanches and applies a positive voltage to the base of Q1, driving it into saturation. The coil of K2 is the collector load for Q1, whose collector current energizes K2 and closes its normally open contacts. This applies operating voltage to relay K1. K1 then switches and opens its normally-closed contacts, removing the DC input voltage from all output terminals as well as the panel monitoring circuits, and both meter needles will fall to the left end of the scale. The input voltage, now somewhat excessive, maintains both relays in their operated positions, without damaging the monitoring and control circuit, until the power supply is turned off. Because the normal elapsed time between a power supply malfunction and its being turned off by the operator will probably be only a few seconds at most, the monitoring circuit will not be adversely affected.

Three optional three-terminal regulators, U1, U2, and U3, derive their input voltages from the input side of shunt R2 and ammeter M1, so the current drawn from these regulators will not be monitored on M1. Voltages of 5, 6, and 9 are suggested as being the most useful if this option is included. Each low regulated voltage should be available at two or three parallel-connected output connectors, such as coaxial power jacks, to provide flexibility in powering small accessories.

Although not indicated in **Fig. 1**, a low-cost AC line voltage monitor which indicates AC line voltage from 90 to 130 VAC is recommended if you have space (see "Line Voltage Monitor," *73*, January 1996, page 86). Unfortunately, the schematic diagram was inadvertently omitted and is reproduced in **Fig. 2**. This will add about three or four dollars to the overall cost of the panel, and will provide a warning if the line voltage falls too low or rises too far.

Even if you have a large budget and have your heart set on nice, neat, high tech digital meters to use for M1 and M2, I very strongly recommend using analog meters instead. A digital meter, while extremely accurate, must be inspected closely to see just what its indication is. An analog meter merely needs a quick glance at the position of the needle to assure you that all is well.

Because new analog d'Arsonval meters are extremely expensive, I suggest you order a "grab bag" of five very high quality surplus meters from: Fair Radio Sales, Inc., PO Box 1105, Lima OH 45802. Phones: (419) 223-2196 and (419) 227-6573. 24-hour FAX: (419) 227-1313. Ask for Catalog No. WS97.

The meters you will receive will be of their choice, not yours, but all will be high quality, name brand meters, with basic movements ranging from 100 µA or less to 1 mA; at a couple dollars each for top quality meters, you can hardly go far wrong.

Fuse F1 should be commensurate with the maximum current your power supply is rated to deliver. Most 100 Watt transceivers draw about 20 Amperes on peaks, so a standard 20A fuse is sufficient. However, if you use modes requiring constant full power output, a slow-blow fuse or a standard fuse rated a bit higher might be the best choice.

Relay K1 can be single or double throw as long as there are closed contacts when the relay is not energized. The contacts must be rated to switch the maximum current expected to be drawn by the load. A DPDT relay with 10 Amp contacts can have the contacts connected in parallel to form a 20 Amp relay. Its coil is rated for 12 VDC.

Relay K2 has very little work to do and its contacts handle only the coil current of K1. A small DIP relay is ideal, and half-Amp contacts are sturdier than needed.

Construction

Just how this panel is constructed depends entirely upon the size of the panel or enclosure and on the size of the meters. The only cautions which should be observed are when connecting C1, C2, and C3 directly across the point where the DC voltage input is applied to the panel, and when routing the heavy wire lead between R2 and the K1 contacts and from R2 to the output terminals on J1. These two leads must connect to the ends of the shunt R2.

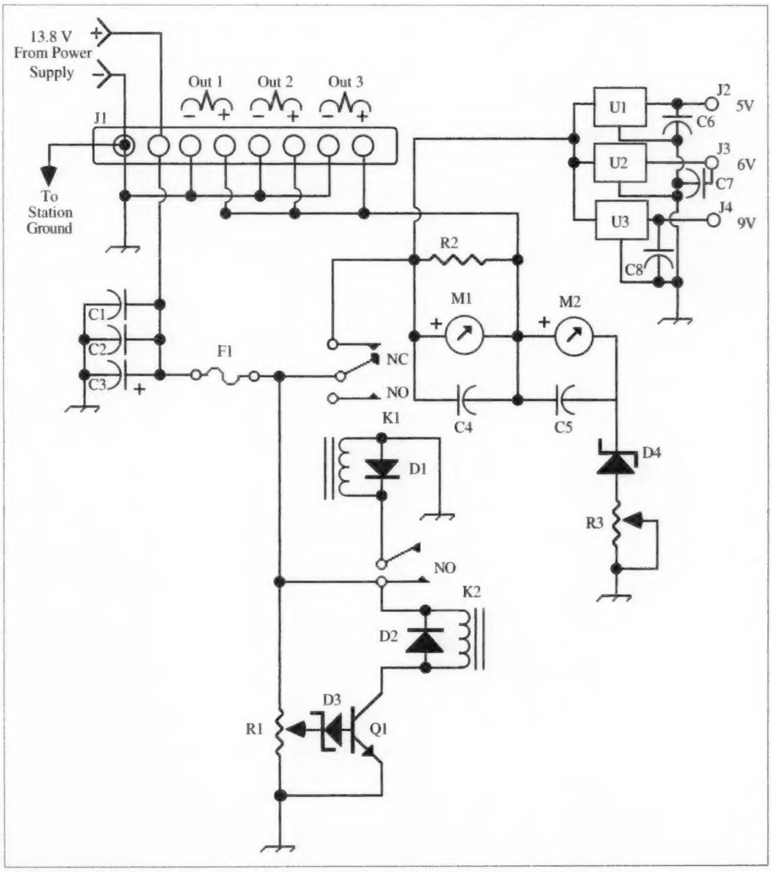


***Fig. 1.** Schematic diagram of the power monitor/distribution panel. Relays shown not energized.*

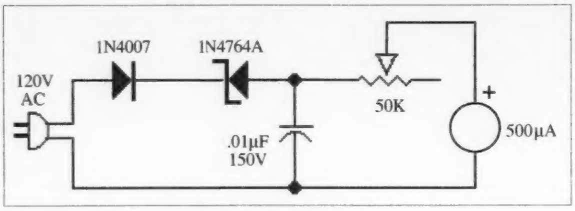


Fig. 2. AC line voltage monitor (optional).

Because there's little chance that the scales on the two meters you use will be exactly what you need, they cannot be mounted until the scales have been modified to fit your requirements and any internal rectifiers, shunts or multiplier resistors have been removed. To accomplish this you will need far more information than can be included here, but do not despair! (See "Use Those Surplus Meters," 73, January 1992, page 42.) If you do not have a copy or cannot locate one locally, back issues and photocopies of articles can be purchased from the publisher. That article has all the information you'll need to modify many different styles of meters.

When you have made the shunt R2 for M1 and changed the meter scale, both can be remounted and wired into the circuit. When M2 and its associated zener diode D4 and voltage adjust trimpot R3 have been determined and the meter scale modified to meet your requirements, these components can be mounted and wired into the circuit.

Before moving into the next section, check all your wiring and all soldered connections. Adjust R1 and R3 to place their wipers at the ground end of rotation.

Adjustment

Temporarily apply the DC output of your power supply to the input terminals of J1, maintaining correct polarity. Place the panel in the same relative position it will occupy when permanently installed, measure the DC voltage between the positive terminal of M2 and ground with a DMM (preferably) or accurate analog multimeter, and note the exact voltage. Adjust R3 so the voltage indicated on M2 is the same as that just measured. Remove the voltage from J1.

Determine the maximum DC voltage your transceiver or other load can withstand and still operate correctly. This will be found in the list of specifications in the operating manual.

Apply a source of variable, filtered DC voltage capable of being varied from below to slightly above the maximum safe level, and set that voltage from the variable source with your DMM or multimeter. Slowly adjust R1 and listen for the click when K1 energizes. Back off R1 until K1 clicks again as it opens, then readjust RI until K1 just energizes. Do this carefully and do not overshoot.

Now, slowly vary the input voltage a bit lower, adjusting very slowly so you can hear K1 click as it operates. Measure the input voltage again with your meter. It should be extremely close to the trip voltage set by R1. Very minor adjustments, made extremely slowly, of R1 may be required until you are sure the DC voltage will be interrupted should it exceed the tripping level you have established. This completes all adjustments. Operation will now be automatic.

Operation

Install the panel permanently where it can easily be seen from your operating position. Connect the DC input and output cables from the station power supply and other equipment to the panel connectors. When all cables have been connected and you are certain no errors have been made, turn the power supply on. The output voltage will be displayed on meter M2.

Then turn a transceiver on. The current drawn in the "Receive" mode will move the needle of M1 slightly up the scale. This will probably not indicate the exact value printed in the specifications. The latter is not exact and transceivers vary among themselves. Also, analog meters usually have a rated accuracy of ±2% of full scale.

Connect a dummy load to the transceiver, and plug in a key. The current indicated by M1 will be close to that cited in the specifications with the key closed. If you do not have a straight key, either a paddle or mike will serve to kick the needle on M1 around to let you see that all is working properly.

Now, turn everything off, get a cold "807" from the refrigerator, lean back in your chair and admire your handiwork. You can be secure in the knowledge that a glance at the meters will be reassuring, and that your expensive rig(s) will be protected automatically should Murphy interfere with your power supply regulator.

Parts List	
C1	0.001 µF ceramic disc
C2, C4, C5, C6, C7, C8	0.1 µF ceramic disc
C3	22 µF 25VDC electrolytic
D1, D2	1N4148
D3	5.6V 400 mW zener diode
D4	10V or 11V 400 mW zener diode
F1	Fuse
J1	Barrier strip or builder's choice
J2, J3, J4	RCA jack or builder's choice
K1	SPDT or DPDT 12V relay, NC contacts
K2	SPST relay, NO contacts, 12V coil, DIP or similar small relay
M1	Ammeter
M2	Voltmeter
Q1	2N3904 or similar NPN small signal transistor
R1	10kΩ trimpot
R2	Shunt
R3	Trimpot voltage adjust
U1	7805 regulator
U2	7806 regulator
U3	7809 regulator

One thing you should remember—if you notice the needle on M2 wiggling up and down on voice peaks or while keying—no regulator is perfect, and because M2 is an expanded scale meter these excursions are much smaller than they appear at first glance.

NEVER SAY DIE

Continued from page 39

good at things, but not *great*. Too lazy, I guess.

*Advantageous skills

archery
art: composition
art: drawing
art: familiarity with famous paintings
backgammon
baseball
bicycling
birdwatching
bookkeeping
bowling
boxing
car repair
cards: bridge
cards: cribbage
cards: poker
cat's cradle
cement making
conversation
cooking
dancing: ballroom
dancing: country
darkroom
desktop publishing
diving
dog training
dowsing
dressing for success
etiquette
fencing
first aid
fishing
flying
games: charades
games: chess
games: go
games: scavenger hunt
gardening
getting work
glassblowing
golf
hang gliding
horseback riding
hunting
ice skating
insect identification
Internet
interviewing
juggling
kite flying
knife throwing
knitting
knot tying
kung fu
languages: French
languages: German
languages: Spanish
leaf identification
magic tricks
map reading
meditation
metalworking
model airplanes
Morse code

Continued on page 59

• DIP switch programmable
• CTCSS encoder
• All 32 EIA tones from 67.0 - 203.5hz included
• May be ordered with custom tones

SS-32PA Encoder
.9" x 1.3" x .4"

SS-32PA DIP Switch Programmable CTCSS Encoder $28.95

• Fully enclosed CTCSS encoder
• All 32 EIA tones from 67.0 - 203.5hz included
• Perfect for mobile / base applications

TE-32
5.25" x 3.3" x 1.7"

TE-32 Multi-Tone CTCSS Encoder $49.95

TP-3200 Shared Repeater Tone Panel

• 51 CTCSS Tones
• 106 DCS Codes
• Supports 157 Repeater Subscribers
• On-Line Computer Help
• Repeater CW ID
• Air Time Loading & Analysis Graphs
• Signalling Formats: CTCSS DCS & DTMF

TP-3200D Table Top Version $269.95 each
TP-3200RM-A Single Rack Mount version $279.95 each
***TP-3200RM-B Triple Rack Mount version $279.95 each**
*Holds up to three TP-3200s

• Eight programmable, selectable messages
• Fully field programmable via included keypad
• Meets all FCC identification requirements

ID-8 Automatic Morse Code Identifier
1.85" x 1.12" x .35"

ID-8 Automatic Morse Station Identifier

NEW LOWER PRICE
$69.95 ~~$89.95~~

Call or write to receive our full Product Catalog

MasterCard VISA

COMMUNICATIONS SPECIALISTS, INC.
426 WEST TAFT AVENUE • ORANGE, CA 92865-4296
(714) 998-3021 • FAX (714) 974-3420
Entire U.S.A. (800) 854-0547 • FAX (800) 850-0547

CIRCLE 10 ON READER SERVICE CARD

CALL TOLL FREE
(800) 292-7711 orders only
Se Habla Español

C&S SALES
EXCELLENCE IN SERVICE

CALL FOR A FREE 60 PAGE CATALOG!
(800) 445-3201

AFFORDABLE, HIGH QUALITY ELENCO OSCILLOSCOPES
2 YEAR WARRANTY

STANDARD SERIES
S-1325 25MHz $325
S-1340 40MHz $459

Features:
• TV Sync
• 1mV Sensitivity
• X - Y Operation
• High Luminance 6" CRT
• Complete Schematic
• Plus much, much more!!

2 FREE probes included with each scope!!

DELUXE SERIES
S-1330 25MHz $419
S-1345 40MHz $549
S-1360 60MHz $749

Features:
• Delayed Sweep
• Automatic Beam Finder
• Z Axis Modulation
• Built-in Component Test
• Plus all of the features of the "affordable" series!!
• Dual time base
• Illuminated internal gradicule

MX-9300
Four Functions in One Instrument
Features:
• One instrument with four test and measuring systems:
• 1.3GHz Frequency Counter
• 2MHz Sweep Function Generator
• Digital Multimeter
• Digital Triple Power Supply
• 0-30V @ 3A, 15V @ 1A, 5V @ 2A
$479.95

Sweep Function Generators

B&K 20MHz Function Generator
Model 4040
$425
• 0.2Hz to 20MHz
• AM&FM Modulation
• Linear & Log Sweep
• Counter Range 5Hz to 30MHz
• 5 Digit Display
• Made in USA

GF-8026 w/ Frequency
• Linear and Log Sweep
• .02Hz to 2MHz
• Counter Range 1Hz to 10MHz
• 4 Digit Display
$225

Model XP-581
4 Fully Regulated Power Supplies in One Unit
4 DC voltages: 3 fixed - +5V @ 3A, +12V @ 1A, -12V @ 1A • 1 Variable - 2.5 - 20V @ 2A
Ideal for laboratories, service shops and hobbyists.
$85

Fluke Multimeters
70 Series
Model 70II $69.95
Model 73II $95.00
Model 75II $129.00
Model 77II $154.95
Model 79II $175.00
80 Series
Model 83 .... $229.00
Model 85 .... $269.00
Model 87 .... $289.00

Model M-6100
Features Computer Interface and Free Software
• Freq to 2MHz
• Cap to 4μF
• Large 3 3/4 LCD Display
• Three Hold System
• Audible Continuity
• Diode Test
• Auto Power Off
• w/ RS-232 Cable
• Relative %
• True RMS AC
$125
• Optional M-110CF to measure temp.
$39.95

B&K Model 1688
High Current (25 DC amp) Power Supply
• Variable 3-14VDC
• 25 amps @ 135V
• Thermal Protection
$249.95

1.3GHz Universal Counter
Model F-1300
• Period
• Frequency & 8 other functions
$225

M-1700
Digital Multimeter
11 functions including freq to 20MHz, cap to 20μF. Meets UL-1244 safety specs.
$39.95

XK-550 Digital / Analog Trainer
Elenco's advanced designed Digital / Analog Trainer is specially designed for school projects. It is built on a single PC board for maximum reliability. It includes 5 built-in power supplies, a function generator with continuously sine, triangular and square wave forms. 1560 tie point breadboard area.
XK-550
Assembled and Tested
$169.95
XK-550K - Kit
$139.95
Tools and meter shown optional
Made in USA

Kit Corner over 100 kits available

Model AR-2N6K
2 meter / 6 meter Amateur Radio Kit
$34.95

Model AM/FM-108K
AM/FM Transistor Radio Kit
$29.95

M-1005K
Digital Multimeter Kit
$19.95
6 functions and Transistor Test

TR-18K Cassette Recorder Kit
with training course
$15.95

WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 5%
OTHERS CALL FOR DETAILS
IL Residents add 8% Sales Tax

C&S SALES, INC.
150 W. CARPENTER AVENUE
WHEELING, IL 60090
FAX: (847) 541-0085 (847) 541-0710
http://www.elenco.com/cs_sales

VISA MasterCard

15 DAY MONEY BACK GUARANTEE
FULL FACTORY WARRANTY
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

CIRCLE 184 ON READER SERVICE CARD

The Insta-Flex 2 Meter Yagi Beam

Right at home in awkward places.

Darwin Ogden KB7WOS
790 West 800 South
Richfield UT 84701

If you have ever transported a yagi beam, or carried it through woods or underbrush, you know how the elements are always catching or getting damaged on something—so you will love the Insta-Flex Yagi Beam. It's inexpensive, easy to construct, and the elements can bend all over the place and still return to their proper positions.

The thing that makes the flexible elements and flexible gamma match possible is an everyday metal carpenter's tape measure. I had thought about using the tape measure for some time. The problem was designing a flexible gamma match. Thanks to suggestions from Dean Harmer WB7PRB and Berry Bradley WB7REL, the combination of flexible elements and gamma match, coax capacitor, and PVC boom came together.

> ***"The elements can bend all over the place and still return to their proper positions."***

I keep my beam in a fishing rod carrying tube behind the seat in my pickup. A cardboard mailing tube or PVC pipe would work just as well.

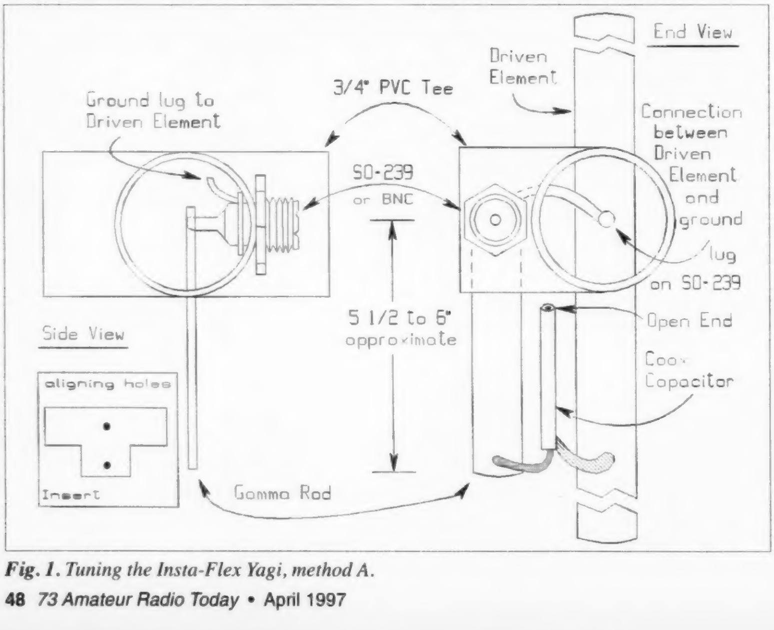


Fig. 1. Tuning the Insta-Flex Yagi, method A.

Setup is instantaneous: Just pull it out of the tube and the elements will spring into position. Connect the coax to the antenna and your radio and you're on the air.

Construction

As shown in **Fig. 1**, I drilled a hole in the 90° side of the "T" for the coax connector. I used a BNC chassis mount on the first, and an SO-239 connector for the second Insta-Flex I built. The BNC is easier to install, but requires an adapter (Radio Shack™ 278-120) to connect it to coax using a PL-259-type connector.

Place one mark on the "T" where the driven element is to be located and one where the gamma rod is to be (see **Fig. 3**). Drill a small hole at the mark, all the way through the "T" where the driven element and the gamma rod will go; this will make an aligning hole. The gamma rod can be mounted either way—up or down.

The curved slot for the elements and gamma rod can be made any way you want (**Fig. 3**). The easiest way I have found is to trace the curve of the tape measure on the PVC, and then use a scroll saw to cut the curve.

Another method is to melt it through using a piece of the tape measure and a propane torch. The curved slot is very important for the rigidity of the elements. If you make a straight slot for the elements, they will lose their ability to spring back into position, because the natural curve will be taken out of the tape measure. Place the piece of tape measure to be used to melt the slot directly over the small aligning hole. Make sure it is perpendicular to the "T" as shown in **Fig. 3**. Heat the piece of tape measure about one inch above the PVC, and when it is hot enough, it will melt the PVC. Light pressure will help force it through. Don't press too hard; the tape measure will bend very easily as the temperature increases. You will probably have to turn the "T" over and do the same thing on the other side. Make sure of the direction of the curve, as the element will have to go through both top and bottom curved slots. After the PVC cools, fit the element.

Make the curved slots for the reflector and director(s) the same way. Attach the SO-239 or BNC with a wire connected to the ground lug, long enough to reach the center of the driven element. Now install the driven element and the gamma rod, and secure them with hot glue or epoxy. Solder the wire from the ground lug to the center of the driven element (**Fig. 1** or **2**).

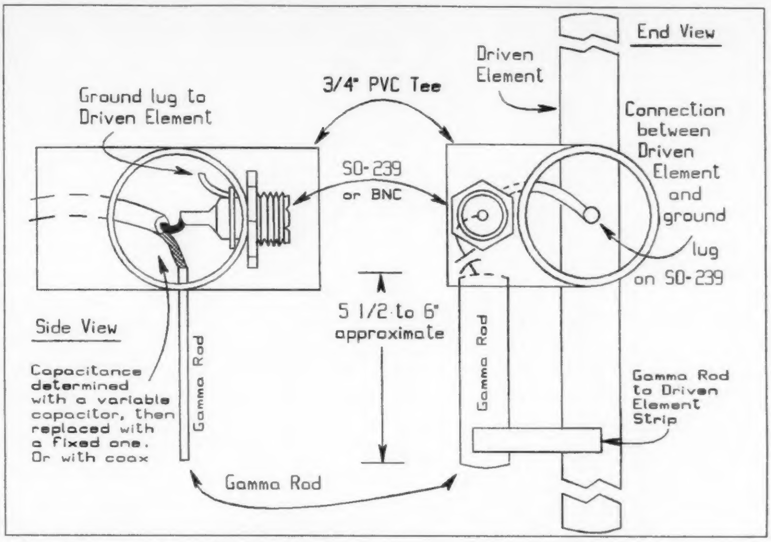

End View
Driven Element
3/4" PVC Tee
Ground lug to Driven Element
Connection between Driven Element and ground lug on SO-239
SO-239 or BNC
Side View
5 1/2 to 6" approximate
Gamma Rod
Gamma Rod
Capacitance determined with a variable capacitor, then replaced with a fixed one. Or with coax
Gamma Rod to Driven Element Strip
Gamma Rod

Fig. 2. Tuning the Insta-Flex Yagi, method B.

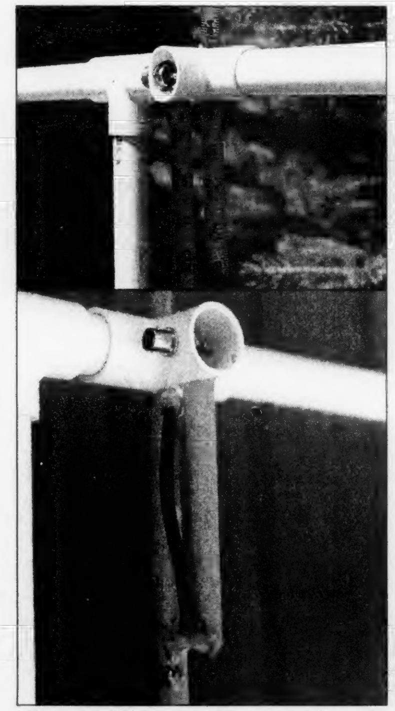


***Photo A1, Photo A2.** Close-ups of gamma section.*

MORE GAIN LESS BOOM

High performance Tri-band, Dual-band & Mono-band Beams
Featuring WA7RAI's critically coupled, bi-periodic$^{PAT. PEND.}$ dual drive system

From space saving 2 elements to long boom pile-up busters, the Raibeam offers more gain per boomlength than any yagi or quad... GUARANTEED!

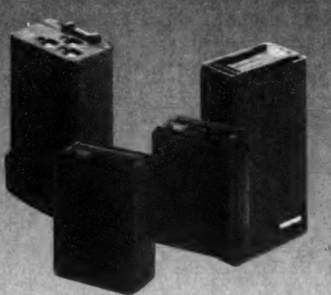
• Get the DX edge with higher gain - lower radiation angles - high F/B ratio - lower noise • Highest quality aluminum & stainless steel hardware • 2 Kw PEP

Raibeam
ANTENNAS INTERNATIONAL
5638 West Alice Ave.
Glendale, AZ 85302

http://members.aol.com/raibeam
E-mail: RAIbeam@aol.com
Sales: 1 800 530-1913
SASE for brochure • VISA-MC-AMEX

NEW LOWER PRICES!

NEW NiMH BATTERIES



PERIPHEX™
REPLACEMENT BATTERIES

ICOM NiMH			YAESU NiMH			STANDARD NiMH		
BP-7SM	13.2v	2200ma	FNB-33M	4.8v	2200ma	CNB-153M	7.2v	1300ma
BP-8M	9.6v	2200ma	FNB-38M	9.6v	750ma	**ALINCO NiCd**		
KENWOOD NiMH			**ALINCO NiMH**			EBP-34	4.8v	1200ma
PB-7SM	7.2v	2200ma	EBP-22SM	12v	1300ma	EBP-34S	4.8v	1600ma
PB-8SM	12v	1300ma	EBP-24SM	7.2v	2200ma	EBP-35	7.2v	900ma
PB-17M	12v	1300ma						
PB-33M	6v	1900ma	EBP-34M	4.8v	2200ma	EBP-36	9.6v	650ma

WE ALSO OFFER
Camcorder Batteries • Accessories • Cordless Phone Batteries
Custom Battery Packs • NiCad Cells • Lithium Cells • Cellular Batteries

Advanced Battery Systems, Inc., 300 Centre Street, Holbrook, MA 02343
(800) 634-8132 • (617) 767-5516 • Fax: (617) 767-4599
http://home.navisoft.com/periphex

CIRCLE 68 ON READER SERVICE CARD

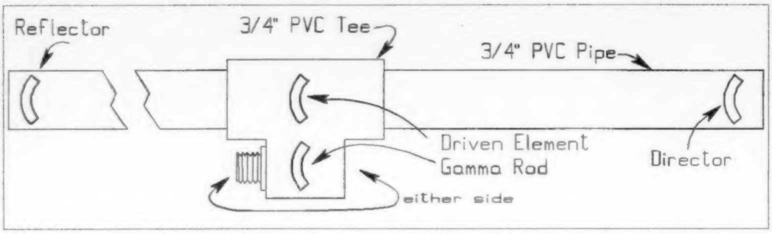


***Fig. 3.** Attaching the elements.*

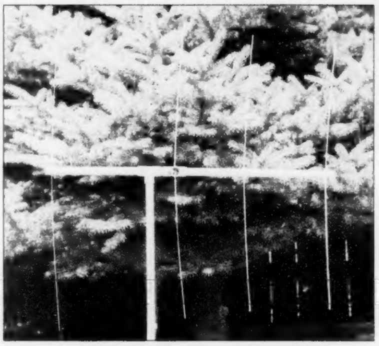


***Photo B.** The Insta-Flex in operation.*

Use either method to complete the gamma match construction. Use a piece of coax to make the needed capacitance. If you use Method A, you may want to put a nonconductive support between the end of the gamma rod and the driven element.

Before securing the reflector and director(s), measure, cut and dry-fit the boom pieces into the "T"s. Once the proper spacing between elements is made, install the reflector and director(s) in the respective slots and secure them using hot glue or epoxy. Line all the elements up and press the boom pieces into the "T"s. You don't have to cement it together. If you do, make sure the elements and boom pieces are lined up *very* quickly; once the cement is set, you can't change it. I didn't cement mine and don't have a problem. If it comes loose, just line up the elements and press it together again.

Tuning

•Method A (**Fig. 1**): Connect the coax to the ends on the gamma rod and driven element as shown. Check SWRs and start trimming the coax off about 1/8" at a time. Check SWRs after each adjustment. After the lowest SWR reading is obtained, if it is not acceptable, try moving the attacking point on the gamma rod and driven element. You may need to trim a little off both ends of each element. It is better to cut the elements a little long and trim them than to have to replace them with longer ones. After the correct length of the coax capacitor is found, seal the open end with hot glue or epoxy. Make sure you leave the end *open*! Glue the coax capacitor to the side of the gamma rod. You might want to glue a piece of nonconducting material between the gamma rod and the driven element for added strength.

> ***"Setup is instantaneous: Just pull it out of the tube and the elements will spring into position."***

•Method B (**Fig. 2**): Use a variable capacitor (optional), and adjust for lowest SWRs. You may have to move the strip between the gamma rod and driven element up or down. After the correct capacitance is found, leave the variable capacitor in place, replace it with a fixed one, or use a coax capacitor. I've found it easier to replace the variable capacitor with coax and trim as needed. With both a three-element and a four-element, I have had better luck and faster tuning using the coax capacitor.

I have shown the Insta-Flex to lots of hams and have gotten lots of strange looks when they see what it's made of and how flexible it is. Try it—if you have comments, questions, or suggestions about improvements, I'd like to hear from you!

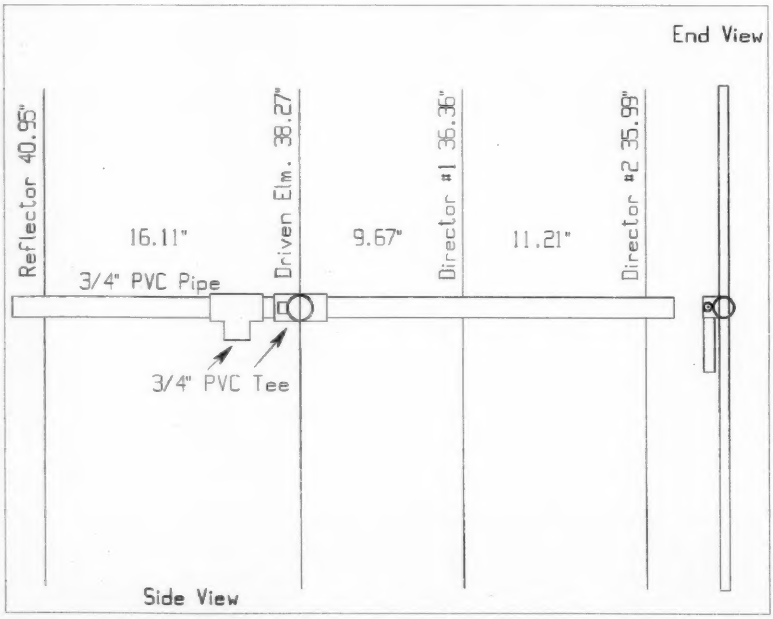


***Fig. 4.** Yagi for 3 or 4 elements.*

Help

the kids learn about the wonderful world of ham radio. Then we'll have the engineers we'll need for the next century here in the USA.

Give a *73 Magazine* gift subscription to the school in your neighborhood... only $24.97.

Please call 800-274-7373.

Share the fun!

SPECIAL EVENTS

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the August issue, we should receive it by May 1. Provide a clear, concise summary of the essential details about your Special Event.

MAR 23

MADISON, OH The Lake County ARA will hold its 19th annual Hamfest 8 AM–2 PM at Madison H.S. on North Ridge Rd. The flea market will feature new and used amateur radio, computer and electronic equip. VE exams, forums, and an equipment test bench will be featured. Adm. $5 at the door. Table space $6 for 6 ft. table; $8 for 8 ft. table. Reservations for tables can be made by calling *Roxanne at (216) 256-0320.*

YONKERS, NY "WECAFEST 97" will be held 9 AM–2 PM at Yonkers Raceway, Central Ave. and Yonkers Ave. Pre-reg. of all vendors, including tailgaters, is recommended. Handicap accessible, door prizes, forums, food, more. Adm. $6. Call the WECA InfoLine at *(914) 741-6606, or write to Thomas Raffaelli WB2NHC or Jeanne Raffaelli N2NQY, 544 Manhattan Ave., Thornwood NY 10594.*

APR 4–5

ATLANTA, GA The Southeastern VHF Soc. of Cornelia GA will hold their 1997 conference at the Atlanta Marriott Northwest Windy Hill, located between Atlanta and Marietta GA (about 45 min. from Atlanta Hartsfield Internat'l Airport). Contact *Tad Danley K3TD* at *(770) 513-9252* or via *k3td@amsat.org.* The Web site is *www.akorn.net/~ae6e/svhfs.*

APR 6

DELOIT, IA The Denison Rptr. Assn. will host an amateur radio swap meet at the Deloit Community Bldg. in Deloit IA, 7 AM–2 PM. Adm. and tables $2. Talk-in will be on the K0CNM rptr. at 147.090. Reservations for table space may be sent to *Jim Currie KB0TLC*, or *Jim Slechta KA0HFR* at *Callbook* addresses. For more info, send E-mail to *John Amdor KD6MXL* at *johnmxl@netins.net.*

APR 10 AND 24

FT. WORTH, TX VE exams will be administered by the Lockheed ARC and the Kilocycle Club, 7 PM, at the Lockheed Rec. Area Facility, 2400 Bryant Irvin Rd. For details call *Ted Richard AB5QU, (817) 293-6745.* Some testing done by appointment only.

APR 11–12

TUPELO, MS The Tupelo ARC and Booneville ARC will co-sponsor the North Mississippi Hamfest and Computer Expo '97, Apr. 11th, 6 PM–9 PM; and Apr. 12th, 8 AM–5 PM. Location: The Mississippi Bldg. of the Tupelo Furniture Market Complex on Coley Rd. All-indoor hamfest/computer show, flea market, vendors, VE exams. Adm. $5, under 13 free when accompanied by an adult. Tables, $20. Contact *Jack Ellis KI5QV, Rt. 4, Box 198-B, Tupelo MS 38801. Tel. (601) 842-7255.* Talk-in on 147.38(+). Rag-chew on 147.24(+).

APR 12

FREDERICKSBURG, PA Northern Lebanon H.S. in Fredericksburg is the location for the 9th annual Hamfest and Computer Show being sponsored by the Appalachian AR Group. The event starts at 8 AM. General adm. $4, kids under 12 free. Indoor tables $14, tailgating $4. VE exams at 9 AM. Handicapped access. Morning seminars. Talk-in on 146.04/.64. Table reservations are recommended and must be prepaid. Tables not occupied by 9 AM are subject to resale. No refunds. Send check for reservations to *AARG, 105 Walnut St., Pine Grove PA 17963. Tel. (717) 345-3780.* Reservations may also be made with *Lanny Hoffman KD3TS, 337 N. 19th St., Lebanon PA 17046. Tel. (717) 274-2148.*

TRURO, NOVA SCOTIA, CANADA The Truro ARC will celebrate their 50th anniversary with a banquet at the Colchester Legion in Truro. Past and present members are invited to attend and celebrate. Reservations are required. A special QSL card has been issued for this historic event, and club members will operate with the special callsign prefix XK1 for the period Apr. 6th–19th. Contact *Dawn MacKay VE1MAK, 52 Spruce Dr., Truro NS B2N 4X6, Canada. Tel. (902) 893-3908,* or *E-mail dawn.mackay@nsac.ns.ca.*

APR 13

MADISON, WI The Madison Area Rptr. Assn. Inc. will hold its 25th annual Madison Swapfest at the Dane County Expo Center's new Exhibition Hall. Commercial exhibitors and vendors with 6 or more flea market tables will be admitted beginning at 3 AM; other flea market sellers will be admitted at 6 AM. Doors open to the public at 8 AM. New and used electronics gear. Talk-in on the M.A.R.A. rptr. W9HSY at 147.75/.15. Adm. $6 in advance, $7 at the door. Children under 10 admitted free. Flea market tables (2.5' x 6') are $15 in advance, plus adm. Reservation deadline is Apr. 5th. Contact *M.A.R.A., P.O. Box 8890, Madison WI 53708-8890. Tel. (608) 245-8890.*

RALEIGH, NC The Raleigh ARS will present its 25th Hamfest and Computer Fair in the Jim Graham Bldg., NCS Fairgrounds, 8 AM–4 PM. Wheelchair access. ARRL, MARS, ARES, NTS, QRP, and DX mtgs. Pre-reg. $5, $6 at the door. All inside. Tables and booths avail. Free parking. RVs welcome. Hospitality party Sat. night. VE exams, contact *AA4MY, (919) 847-8512.* For pre-reg. and dealer inquiries, contact *Ronnie Reams WA4MJF, 3509 Rolesville Rd., Wendell NC 27591. Tel. (919) 217-0263. Talk-in on 146.04/.64.*

APR 19

BELTON, TX A Ham Expo-Tailgate will be held at Bell County Expo Center starting at 7 AM. Adm. $1. Handicap access. Indoor tailgate spaces $10 at the door; setup begins at 6 AM. Vendor tables $20 ea. (reserve by Apr. 11th). Free elec. Commercial vendor Fri. eve. move-in surcharge, $10 per table. Sponsored by Temple ARC, 1802 S. 13th St., Temple TX 76504. Phone *Mike WA5EQQ, (817) 773-3590; E-mail: mlefan@vvm.com. Expo netpage—http://www.tarc.org.*

APR 20

CANFIELD, OH A giant outdoor flea market will be sponsored at the Canfield Fairgrounds, State Route 46 in Canfield OH, by the 20/9 Radio Club, Inc. Open 8 AM–3 PM. Free parking. Tickets $5 at the door. Inside tables $10 per 8 ft. Outdoor flea market free with admission. Talk-in on 145.275(-), 224.420(-), and 442.750(+). For more info, contact *Don Stoddard N8LNE, 42 S. Whitney Ave., Youngstown OH 44509. Tel. (330) 793-7072.*

APR 26

FLATWOODS, WV The 4th Annual Central WV Hamfest, sponsored by the Pioneer ARA, will be held 9 AM–3 PM at Braxton County H.S., I-79 Exit

MultiMode

TNC

BayPac™ NEW

SITOR A/B
ARQ/FEC
BAUDOT
PACKET
NAVTEX
FAX 480
AMTOR
WEFAX
SYNOP
ASCII
RTTY
SSTV
CW
More...

BayPac
Model BP-2M
MultiMode
FCC ID: EVFBP2M
Tigertronics, Inc.

BP-2 Packet Only $49.95
BP-2M MultiMode $69.95
+ $5 Shipping & Handling

The best little packet modem just got better! Building on the tradition of the BP-1 Packet Modem, we are very proud to announce the BP-2 and BP-2M. The BP-2 is a new and improved version of our famous BP-1, while the BP-2M expands your horizons even further with MultiMode operation! So, whether you have been waiting to automate your CW, checkout AMTOR or just copy Weather Fax - Now is the time for you to jump in and join in all the fun!

Tigertronics INCORPORATED

Call Today! 1-800-8BAYPAC
800-822-9722 (541) 474-6700 *Fax* 474-6703
World Wide Web: http://www.tigertronics.com

VISA MasterCard

Tigertronics, Inc. 400 Daily Ln. P.O. Box 5210 Grants Pass, OR 97527

CIRCLE 269 ON READER SERVICE CARD

67. Local motel available. Free parking. Dealers welcome. Tickets $5, flea market space $10 a table. First-come, first-served, unless reserved. Talk-in on 145.29 and 146.655. Contact *Ed Messenger N8OYY, (304) 462-5312;* or write to: *PARA/Hamfest, P.O. Box 301, Glenville WV 26351.*

HARMONY, NJ The 1997 Cherryville Hamfest will be held at Warren County Farmers Fairground on County Route 519 in Harmony. Open 8 AM–2 PM, setup at 6 AM. Adm. $6. Spouses and children under 12 free. Tables $20, indoor space includes electric, $10 outdoor tailgating space. VE exams $6.25. To pre-register and get details, call *Charlie Kosman WB2NQV at (908) 788-4080.*

SYRACUSE, NY "Spring Fest '97" will be held by the Liverpool Amateur Reptr. Club at the New York State Fairgrounds (Cattle Bldg.). The gate charge for anyone entering the bldg. is $5 per person. The bldg. will be open at 5 AM for vendors, 8 AM for tailgaters and the general public. Hamfest hours are 8 AM–2 PM. Vendors must exit by 5 PM. 8 ft frontage space $5 in advance, $10 at the door. Tables $7.50 ea. in advance, $10 ea. at the door. *Make payable to L.A.R.C.* and mail to *Tom Delasin WA2DAD, 4172A Burning Tree Rd., Liverpool NY 13090.*

APR 27

ARTHUR, IL The Moultrie AR Klub will hold their 35th Annual Hamfest at Moultrie/Douglas County Fairgrounds on the south side of Arthur, just off Route 133 behind the high school. Hours: 8 AM–1 PM. Adm. $4 per person over 14 yrs old. Tables $10 ea. in advance. No exams this year. Contact *M.A.R.K. P.O. Box 91, Lovington IL 61937;* or call for info *days, (217) 543-2178; eves., (217) 873-5287.* Talk-in on 146.055/.655 and 449.275/444.275.

FISHKILL, NY The ARRL Eastern New York Section Convention will be held at the Mt. Beacon Hamfest at John Jay H.S. in Fishkill. Ham radio, computer and electronics flea market. Adm. $5, spouses and kids free. Advance tables $8, $10 at the gate. Tailgating. Bring-your-own-table, $6 a spot. VE exams for all license classes. Talk-in on 146.97(-). Contact *Ken Akasofu KL7JCQ, 316 Titusville Rd., Apt. 4, Poughkeepsie NY 12603-2944. Tel. (914) 485-9617; Fax: (914) 485-2402. E-mail: Ken.Akasofu@bbs.mhv.net.*

MAY 3–4

ABILENE, TX The Key City ARC will sponsor the ARRL West Texas Section Convention and Hamfest at the Abilene Civic Center 8 AM–5 PM Sat., and 9 AM–2 PM Sun. Free parking. VE exams. Wheelchair access. Tables $6 ea. Pre-reg. $7 (must be received by Apr. 29th), $8 at the door. Talk-in on 146.160/.760. Contact *Peg Richard KA4UPA, 1442 Lakeside Dr., Abilene TX 79602. Tel. (915) 672-8889.*

MAY 4

HAGERSTOWN, MD The Antietam Radio Assn. will sponsor the Great Hagerstown Hamfest & Computer Show at Hagerstown Jr. College, Athletic, Rec., & Community Center. Setup Sat., May 3rd, 6 PM–9 PM, and May 4th, 6 AM–8 AM. Volunteers will be available to assist. All vendors responsible for collecting applicable state tax. Proper tax and license certificates should be made available upon request. Outside tailgating spaces $5 per space. Adm. $5, children under 12 free. Tables paid in advance are $15 ea. A discount is available for 11 or more tables. Limited free electric hookups. Contact *ARA, P.O. Box 52, Hagerstown MD 21741. Tel./Fax (301) 791-3010.* VE exams at 9 AM, at no charge, by the Mountain VEC. Walk-ins accepted. For testing info, contact *Leo Patterson KQ8E, (304) 289-3576,* or *Gay Rembold W3DFW, (301) 724-0674.* Talk-in on 146.940/.520 simplex on the day of the event and on the night before.

MAY 10

GREENVILLE, SC A hamfest will be sponsored by the Blue Ridge ARS, 8 AM-5 PM, at the Anderson County Fairgrounds, E of Anderson on Hwy. 29 Business. Flea market, Buck Rogers, K4ABT SEDAN packet conference, VE exams at noon, overnight camping, free parking. Talk-in on 146.01/.61. Advance adm. $4; $5 at the door. Contact *Gene WB4ZBZ,* or *David KE4QQQ, (864) 476-2609, E-mail: ke4qqq@innova.net.*

MAY 15–18

DAYTON, OH The "Four Days In May"© QRP Symposium on Thursday, May 15th, held in conjunction with the Dayton hamvention©, will kick off QRP activities at Dayton. Full day of activities on Thursday at the Days Inn Dayton South (513-847-8422); includes multimedia QRP presentations, catered lunch, door prizes, tech talks, tutorials by clubs. Thursday registration $30 before May 1, $35 after (if still available). Make checks *payable to "Bob Follett" and send to: Bob Follett AB7ST, 2861 Estates Dr., Park City UT 84060, E-mail: bfollett@ditell.com.* On Fri., May 16th, the QRP-ARCI Awards Banquet will be hosted by FDIM Banquet Chairperson Pete Meier WK8S. Please send $15 banquet ticket fee (US check, MO, internat'l MO) *made out to "Pete Meier"* by May 1st. Mail to *Pete Meier WK8S, 4181 Rural, Waterford MI 48329;* or *E-mail pmeier@tir.com.* Also on the 16th, Preston Douglas WJ2V will host the FDIM QRP Vendor Evening Social. To register, contact *Preston Douglas WJ2V, QRP Vendor Evening Chairperson, 216 Harbor View N., Lawrence NY 11559,* or via *E-mail: pdouglas12@aol.com.*

MAY 16-18

DAYTON, OH The Dayton Hamvention©, sponsored by the Dayton ARA, Inc., will be held at the Hara Arena. Fri., May 16th: Flea market open and bus service avail., 8 AM–6 PM; exhibits, noon–6 PM; forums 1 PM–5 PM. Sat., May 16th: flea market and bus service 7 AM–5 PM; exhibits 8 AM–5 PM; forums, VE exams, activities, 9 AM–5 PM; hamvention banquet at the downtown Dayton Convention Center, 6 PM. Sun., May 17th: flea market 7 AM–4 PM; bus service available 7 AM–5 PM; exhibits open 8 AM–2 PM; forums and activities 9:30 AM–1:30 PM: prize drawings 2 PM. Programs available Fri. at 7 AM in the Hara Arena lobby and in the tent in front of the East Hall entrance. Flea market spaces are sold in advance only; a maximum of 3 spaces per person (non-transferable). Limited to amateur radio, electronic, and related items only. Electricity available in a portion of the last flea market row for $60 a space extra. Tables and chairs not available. Contact the *Flea Market Chairman by FAX at (937) 253-1289, by E-mail at fleamkt@hamvention.org,* or by *voice mail at (937) 276-6932;* allow 30 seconds for the phone routing system to transfer the call. Registration tickets in advance $13, at the door $15. Banquet tickets in advance, $25; after May 17th, if available, $30. Flea market spaces $50/1 space, $110/2 adjacent, $220/3 adjacent; elec. $60 extra each space. Covered tent w/elec. $325 ea.

SPECIAL EVENT STATIONS

APR 18–20

CHARLOTTESVILLE, VA The Albemarle ARC will operate station WA4TFZ, 2300Z Apr. 18th–2300Z Apr. 20th, to commemorate the Charlottesville Dogwood Festival. Operation will be in the General portion of the 80, 40, and 20 meter bands, and the Novice portion of the 10 meter band. For QSL, send QSL and SASE to *Bill Bearden KC4TQF, 237 Falling Rock Dr., Stuarts Draft VA 24477 USA.*

APR 25–26

THOMASVILLE, GA The Thomasville ARC will operate W4UCJ 1700Z–2300Z Apr. 25th and 1100Z–2000Z Apr. 26th, to commemorate the 76th Annual Rose Festival. Operation will be in the lower portion of the General 80, 40, 20 and 15 meter phone subbands, and the Novice 10 meter phone subband. For a certificate, send QSL and a 9" x12" SASE to *TARC/Rose Festival Station, P.O. Box 251, Thomasville GA 31799 USA.*

MAY 3–4

DANBURY, CT The 1997 Connecticut QSO Party will be sponsored by the Candlewood ARA, 2000Z May 3rd–2000Z May 4th, with a rest period 0400Z–1200Z. Phone, RTTY and CW. For operating rules, contact *CARA, P.O. Box 3441, Danbury CT 06813-3441 USA.* Please remember to send an SASE.

PHILADELPHIA, PA The Olympia ARC will operate WA3BAT from 1300Z May 3rd–2000Z May 4th, to commemorate the 99th anniversary of Admiral Dewey's triumph over the Spanish fleet at the Battle of Manila Bay. SSB/Phone: 3.898.5, 7.248.5, 14.248.5, 21.368.5, 28.368.5, 145.270 FM. CW: 3.710, 7.030/.110, 14.030, 21.040/.110, 28.025. For a certificate, send QSL and a 9" x 12" SASE to *Olympia ARC, Independence Seaport of Philadelphia, 211 South Columbus Blvd., Philadelphia PA 19106 USA.*

Radio Bookshop

Phone 800-274-7373 or 603-924-0058, FAX 603-924-8613, or see order form on page 88 for ordering information.

Rene's Books

NASA Mooned America. René makes an airtight case that NASA never landed anyone on the moon. Ridiculous, of course, so maybe you can be the first to find fault with René's 30 "gotchas." He sure convinced Wayne. $25.

The Last Skeptic of Science. René blows holes in one cherished scientific dogma after another. Do you believe there have been ice ages? That the moon causes the tides? That the iron core of earth causes its magnetic field? That the transmutation of elements is difficult? Another $25 well spent.

Number 53 on your Feedback card

HAM TO HAM

Your Input Welcome Here

Dave Miller NZ9E
7462 Lawler Avenue
Niles IL 60714-3108

Free test signals

From Phil Salas AD5X: "Those little MFJ SWR analyzers also make great little portable signal generators for general testing purposes. In order to do their job as SWR analyzers, the units need to simulate a very low power CW transmitter, along with an equally sensitive SWR metering circuit. You can therefore use these little gems for general signal injecting or troubleshooting, as well as for antenna and transmission line analysis.

"In order to achieve a variable RF signal output, I've used a Radio Shack™ #15-578 variable 75-ohm TV attenuator, along with the appropriate adapters, to reduce the signal level to whatever I've needed for the particular troubleshooting job at hand. I also decided to open up the Radio Shack attenuator's case and replace the F-connectors with BNC connectors. Just another twist to make the attenuator even handier! And speaking of Radio Shack, I've found that their #21-506 50-ohm dummy load can be expected to work well up to about 500 MHz. It will handle 10 watts continuously, or even 100 watts for a few seconds at a time. I've put 100 watts into mine a number of times, getting it so hot that I couldn't touch it, and it doesn't seem to have damaged or degraded the unit's SWR in the least. Try not to overdo it, though!"

Hard-to-find variable caps

From John Nix: "If you find yourself in need of a fairly large, fairly expensive variable capacitor for that low frequency antenna tuner project you've been putting off, here's an idea you might want to consider adapting to your own requirements.

"Just as an example, let's assume you're looking for a 1,000+ pF variable cap... not the easiest thing to come by... but don't let that stop you. Variable caps in the 365 to 420 pF range are fairly common, so all you really need to do is to switch in additional 350 pF (or so) good quality (meaning stable) fixed capacitors, ones that will put you in the right range, until you have the value over the maximum value of your variable cap on hand. In other words, if you need a maximum of 700 pF, use a 365 pF variable and a 350 pF fixed cap in parallel... this will give you something in the area of a 380 to 715 pF variable. If you'd like to get up to a 1,000+ pF variable as mentioned before, use a 365 pF variable along with two paralleled 350 pF fixed capacitors, for a total of 730 to 1,065 pF variable. **Fig. 1** shows how to do this using just a two-pole, three-position rotary switch. Of course, you can substitute whatever actual values you wish for the various capacitors, and add more fixed 'jumps' by using a rotary switch with additional poles and additional positions; another pole and another click-stop position are needed for each fixed capacitor 'jump' above that shown in **Fig. 1.** It's worth keeping in mind for future use, even if you don't have an immediate need right now... it can save you some money that might have otherwise been spent on high-priced, hard-to-find high-picofarad variable caps!"

> ***"This sounds like it might be an excellent opportunity for a budding machinist/entrepreneur..."***

Hot stuff!

From Richard Measures AG6K: "The explanation that follows will help you to understand why the electrolytic filter capacitors in the popular Heath SB-220 linear amplifier, and others of similar design, are subjected to a higher-than-healthy degree of heat during 'normal' operation. The SB-220 is typical of many linears in ham shacks around the world, so these tips may well find applicability in yours, regardless of its actual brand-name and model number.

"A major source of heat applied to the electrolytic filter capacitors in the SB-220 is from the eight 30k, 7-watt voltage-equalizing resistors that are directly adjacent to the eight electrolytic filter capacitors used in the high-voltage power supply. A minor source of capacitor heating results from a 60 Hz ripple current flowing through each capacitor's inevitable internal resistance. In the SB-220, the filter capacitor heating problem is compounded by the fact that air cooling from the amplifier's fan doesn't directly reach the capacitors' metal cans... this is because the molded plastic covers that surround and insulate each electrolytic also act as thermal barriers. Some amplifiers use paper slip-on covers, but all use some form of insulating medium because of the high voltage on the metal cans themselves (since they're above ground in almost all cases). In the SB-220, I've seen this plastic insulating material actually melt in the areas nearest the eight 30k, 7-watt resistors! One can only imagine what the temperature inside the cap must be! It's worth mentioning that wet electrolytic capacitors will have their life expectancy reduced by a predictable amount for every degree rise over normal room temperature (70 degrees F). Many electrolytics are also marked as having a maximum permissible operating temperature... a temperature that should never be exceeded under any circumstances. By the way, that doesn't mean that the capacitor can be operated near that maximum without lifeexpectancy degradation, as mentioned before.

"It's interesting to note that the heat produced by these eight 30k resistors can be reduced by 570% simply by changing them to 100k, 2- or 3-watt metal-oxide-film resistors instead. This modification alone should greatly prolong the expected life of the eight filter capacitors in an amplifier like the SB-220. Other resistance values may be used, up to about 150k, provided the resistors themselves can withstand the voltage across them. Metal-oxide-film resistors of the 2- to 3-watt variety are

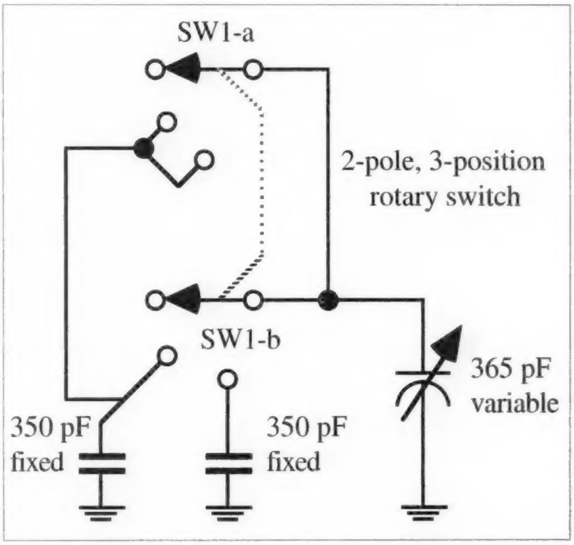


Fig. 1. *Paralleled fixed capacitors, added to a variable capacitor via a rotary switch, will provide an (apparent) increased maximum value for the variable—see text.*

often only rated at 350 volts maximum across the element, but this can easily be doubled by using two 50k resistors in series (in place of one 100k unit). Spiral-film resistors, if available, can also be used, since they'll withstand higher voltages across them than any other variety of resistor. By the way, I don't recommend using the older carbon composition types; they don't maintain their tolerances well with heat and age.

"Increasing the value of the equalizing resistors across the filter capacitors will also increase the 'bleed-down time' of the capacitors when the power is turned off. Therefore, be especially careful to allow enough time for the charge on the caps to bleed off by watching the voltmeter on your amplifier drop to zero. Then apply a reliable jumper lead from the HV anode terminal directly to ground to provide a sure ground path for the high tension point.

"Here's another caveat about something that can occur in some linears with an automatic shorting interlock switch, such as the Heath SB-220: It will spill the HV filter caps' charge directly into the grid-current metering shunt when a short is applied by the interlock switch action or by an external jumper to ground, if the charge on the caps has not been allowed to bleed off normally. If the meter happens to be in the grid-current position when this happens, it can be destroyed in short order under these conditions! So just opening the HV compartment can potentially (no pun) fry your amplifier's metering circuit—something you wouldn't normally think of unless you've seen it happen. That's another good reason not to leave the multimeter switch in the grid-current position and to not even go into your linear until the caps have had a reasonable time to bleed off their high voltage charge. So again, put the meter in the high voltage voltmeter position and keep an eye on it until it's safe to enter."

Moderator's note: One source for the metal-oxide-film resistors mentioned in Rich's piece is Digi-Key Corporation, 1 (800) 344-4539. As an individual, Rich has done an amazing amount of research into amateur HF amplifiers, their peculiarities and their shortcomings. I've found his "fixes" to be practical, and his procedural outlines should be manageable by the average ham radio hobbyist. As Rich said, please remember that anytime you're working around high voltage components you should take time to think about the safety procedures that must be followed. We tend to become somewhat complacent since most of our servicing is done on low voltage electronics these days, but the high voltage present in tube equipment is just as deadly as it ever was—maybe more so because of our current tendency toward complacency. I know that I have to keep reminding myself to go slowly and cautiously when tube anode potentials are nearby.

Easy in and easy out

From Mark Marholin KE6JJR: "For TS-50S and IC-706 (and probably most other rigs) mobile users, the standard screws used to attach the radios to their mobile mounts are 4mm x 20mm Phillips-head screws. This makes removal of your radio from your mobile mount inconvenient and time-consuming. Sometimes getting even a 'stubby' Phillips screwdriver alongside the radio's mounting bracket can be challenging.

"For a major improvement in this area, purchase 4mm x 20mm steel hex head screws and #4 thumbscrews from your local hardware store or home center. Cut off all but three or four threads on the threaded portion of each of the thumbscrews and screw them into the hex head of the 4mm x 20mm screws. This will be simply a friction fit, but it will hold the thumbscrew part to the hex head screw part temporarily. Now solder the thumbscrew part to the hex head part with silver solder, acid flux (not rosin flux) and plenty of heat. Clean the screws well when cool to remove all traces of the acid flux. Now you have 4mm x 20mm thumbscrews that make it a snap to install and remove your mobile rig from its mobile mount by hand."

Moderator's note: This sounds like it might be an excellent opportunity for a budding machinist/entrepreneur—supplying metric thumbscrews for a variety of uses in the amateur radio market. These are the types of recognizable business opportunities that Uncle Wayne has spoken of so often in his editorials. There are many such "gateways of opportunity," supplying simple but necessary

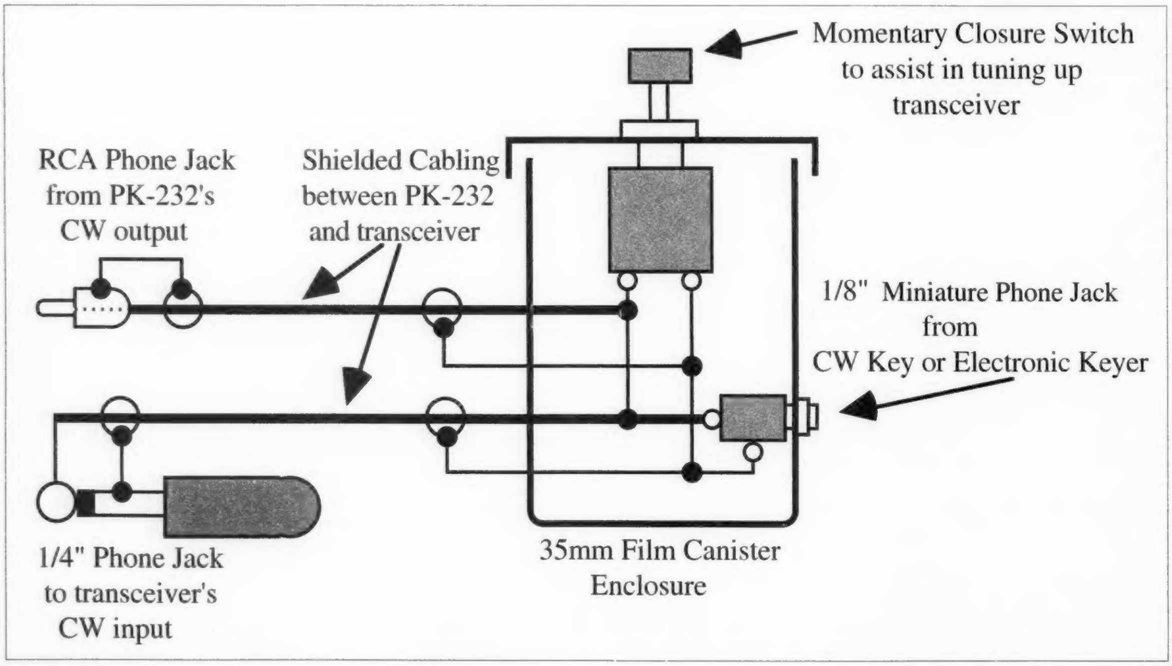

Momentary Closure Switch to assist in tuning up transceiver
RCA Phone Jack from PK-232's CW output
Shielded Cabling between PK-232 and transceiver
1/8" Miniature Phone Jack from CW Key or Electronic Keyer
1/4" Phone Jack to transceiver's CW input
35mm Film Canister Enclosure

Fig. 2. AD1B's "Tune-up Assistant." See text for full details.

accessories to the amateur marketplace. They can sometimes lead to eventual independence from the need to get up every day and trudge off to the same job at someone else's place of business.

Photo opportunity

From Thomas Hart AD1B: "Being active on all bands from 160 through 2 meters, on a variety of modes, I decided to add a PK-232 terminal unit to my station to augment CW as well as the various digital modes of operation. Since converting over, I've found myself using my straight key and keyer very infrequently, relying instead on my computer and terminal node controller (TNC) for virtually all non-voice communications.

"For those times when I need to manually key the transmitter (for adjusting power output and for antenna tune-up), I've found this simple device (shown in **Fig. 2**) to be more than adequate. Basically, it consists of a discarded 35mm film canister, holding a momentary push-button switch, that can be used to key my transmitter, allowing me to make final adjustments to the transceiver/transmatch combination. There's also a miniature female 1/8" phone jack in the side of the canister for inserting a straight key, bug, or electronic keyer if desired... just for nostalgia.

"The few parts needed are readily available from any Radio Shack store and the layout is noncritical, quick and easy. Simply cut the line that presently connects your TNC to your rig's keying input and insert the circuit shown in Fig. 2 in parallel with that line. The entire project should take only a few minutes to complete... not counting the time needed to go to the store to buy the roll of film! The converted film canister stands on the shelf next to my Kenwood transceiver and has been very useful for my own operating setup. I hope that some variation on it will work for you just as well."

More small bulbs

From Andrew Gretchenuk: "A good replacement bulb for meters and dials in modern transceivers can be found in the type 2182 miniature lamp. The 2182 is rated at 14 volts at 80 milliamperes and has an average bulb life of 40,000 hours (that equates out to nearly five years of constant running!). If operated at somewhat less than 14 volts, the life expectancy will naturally increase. For instance, when operated at 12 volts, the 2182 lamp draws 75 milliamperes and will probably last 20 to 25% longer yet. Long life for our transceiver's bulbs is important, especially if the equipment is left running 24 hours a day, as in the case of most packet BBSs, digipeaters, and network nodes. The 2182 lamp measures about 3/16" in diameter and 7/16" long and comes with sufficiently long wire leads. It would be a good replacement choice for spots where that physical size doesn't preclude its use. Check out the Mouser catalog (tel. 800-992-9943; http://www.mouser.com) as one source for this lamp and keep a few of these bulbs on hand."

Check out this Web site

73 Amateur Radio Today's "Ham To Ham" column *past columns* are now available on the Internet Web pages at: http://www.rrsta.com/hth as a service to the column's readership. The site is being provided through the good graces of Mark Bohnhoff WB9UOM. Surf over and have a look!

Don't put off sending in your own favorite tips, ideas, suggestions or shortcuts to my address at the beginning of the column. To keep "Ham To Ham" lively and interesting I need more continuous input—your input. Just jot down whatever you'd like to pass on to others from your own experiences in our hobby and I'll do the rest. I'm waiting to hear from you.

•Murphy's Corollary: Whatever it is that you want to do, you must always do something else first!

Finally, a special thanks to all of this month's contributors:

Phil Salas AD5X
1517 Creekside Drive
Richardson TX 75081

John Nix
9123 Highway 23 NE
Foley MN 56329-9501

Richard L. Measures AG6K
6455 La Cumbre Road
Somis CA 93066

Mark Marholin KE6JJR
1588 Four Oak Circle
San Jose CA 95131

Thomas M. Hart AD1B
54 Hermaine Avenue
Dedham MA 02026

Andrew Gretchenuk
12233 Rosaro Avenue
Warm Mineral Springs FL
34287

Note: The ideas and suggestions contributed to this column by its readers have not necessarily been tested by the column's moderator nor by the staff of 73, and thus no guarantee of operational success is implied. Always use your own best judgment before modifying any electronic item from the original equipment manufacturer's specifications. No responsibility is implied by the moderator nor by 73 for any equipment damage or malfunction resulting from information supplied in this column.

Please send all correspondence relating to this column to *73's* "Ham To Ham" column, c/o Dave Miller NZ9E, 7462 Lawler Avenue, Niles, IL 60714-3108, USA. All contributions used in this column will be reimbursed by a contributor's fee of $10, which includes its exclusive use by *73*. We will attempt to respond to all legitimate contributors' ideas in a timely manner, but be sure to send all specific questions on any particular tip to the originator of the idea, not to this column's moderator nor to *73*.

The New QRP Plus
A Quality Transceiver for the Serious Low Power Operator

Completely Re-engineered!

INDEX LABORATORIES
140500

- An all new receiver design incorporating a custom mixer from Synergy Microwave Corp. for strong signal performance and dynamic range to compete with the best full size transceivers
- RF speech processing and improved ALC circuit add effectiveness to SSB transmit.
- New wide range, smooth acting AGC circuit is free from overload.
- I.F. noise limiting reduces interference without adding distortion or compromising performance
- General coverage receiver tunes from 1.8MHz to 30MHz SSB & CW
- All band transmit 160-10M SSB & CW
- Improved full break in CW and built in iambic keyer
- SCAF filters, Variable bandwidth from 100Hz to 2400Hz. No ringing even at 100Hz setting
- Very low power drain - 180Ma @ 12V means full weekend of operating on small battery
- 20 memories, SPLIT, RIT

Custom designed mixer from Synergy Microwave Corp. is the heart of a new high performance receiver.

SYNERGY
INDEX-1
9545

Designed & Built in the U.S.A

$695

INDEX LABORATORIES • (206) 851-5725 • Fax: 851-8385
9318 Randall Dr. NW, Gig Harbor, WA 98332

Number 56 on your Feedback card

ASK KABOOM

Your Tech Answer Man

Michael J. Geier KB1UM
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

More TV

Last time, we examined the history and basic theory behind scanning a television image. Let's continue, this time looking at color and the makeup of the video signal.

The magic rainbow

As soon as fully electronic television began to take off in the marketplace—perhaps even before then—work began on adapting it for color. Borrowing from the old scanning disk concept, CBS created a color TV system that was a hybrid of the old and the new. It used a picture tube to create a monochrome image, with a rotating disk in front of it. This disk didn't scan the image, though. Instead, it was broken up into three sections, each consisting of a color filter for each of the additive primary colors: red, green and blue. The disk was automatically synchronized to the vertical scan rate of the incoming signal, resulting in the successive display of three pictures, one in each color. The human eye, which cannot sense color changes very fast, integrated all three pictures into one full-color image. It worked, but it had limited brightness, due to the light loss through the filters, and there was some flicker. And, just like with the old mechanical scanning system, it took a big disk for the size of the resulting picture to be acceptable.

Ultimately, an all-electronic system created by RCA engineers won out, just as all-electronic television itself had displaced mechanical scanning. But how the heck do you create colors on the face of a tube?

Rare earths

Just as the phosphors in monochrome picture tubes could be made to give off white light (well, OK, bluish-white), it was found that various minerals called "rare earths" would generate different colors when struck by an electron beam. With careful selection, it was possible to create red, green and blue phosphors. The trick now was to scan three separate images, with three separate beams, in one picture tube. How could you do that?

Playing the angles

The answer was simple geometry, combined with some high-precision manufacturing. The colored phosphor dots were deposited on the inside face of the picture tube in a repeating pattern, each group of three next to another. For many years, that pattern was a tiny triangle composed of round dots. Then, in the 1960s, the Sony Corporation invented and introduced their Trinitron™ tube, which put the three colors in stripes, one color next to the other. This resulted in more of the beams hitting the phosphors instead of the space between them (because there was less space wasted), and thus much higher brightness—it gave the company's TVs a tremendous advantage. The basic Trinitron patent has long since expired, and virtually all current sets are made with striped tubes.

A quick detour

By the way, if you're thinking that having the colors next to each other, no matter what the configuration, would produce three images that didn't quite overlap perfectly, you're absolutely right! Luckily, the human eye's ability to distinguish color changes over small distances is very limited. The result is that the eye blurs the three pictures into one full-color image. Heaven only knows what a color TV picture looks like to an eagle. Probably nothing very good. If you want to see what the picture is really made of, get right up to the face of the tube and take a look—you'll plainly see the red, green and blue stripes. The only TV sets that actually overlap color are projection sets with separate projection tubes, one for each of the three colors.

Back to our story

So, you now had the necessary elements to paint three pictures. But, how to scan the three images? At the back of the tube, in the neck, were separate "electron guns," which were just like the ones in a monochrome tube, except that there were three of them next to each other. Behind the layer of phosphors on the tube's face, a metal grille with very fine holes, called the "shadow mask," was placed. The angle of the holes permitted only the beam coming from the requisite gun to enter, so the beam for the green image could only light up green phosphors, and so on. Now, it really was possible to paint three colors at the same time, all independently. But from where was the color signal to come?

Sooo-eeee!

Talk about a bandwidth hog! It was possible to simply transmit three complete TV signals, use three tuners at the set, and be done with it. Possible, yes. Practical, no. First of all, such a scheme would require using up three times the spectrum space of a monochrome signal. Second, it would require three times the transmitter power. Third, three tuners in each set would be mighty expensive. Finally, doing it that way would make the signals incompatible with the millions of existing monochrome sets. Why? Because the mono set would only be seeing a picture whose brightness values corresponded to one color out of three. It would be recognizable, but it would sure look weird.

Another approach

There had to be another way, and there was! Inventing it meant thinking of a color picture in a completely different way: as two separate elements. One was the brightness of each dot on the screen, which was exactly the same as with any monochrome picture. The second was the color value of that dot, which itself consisted of two more elements: hue (such as red, orange, etc.) and saturation (how strong the color was).

The advantage of treating the picture that way, instead of as three separate images, was tremendous. Now it was reasonable to consider sending the image in about the same bandwidth as a monochrome picture. Remember when I said that the eye can't discern fine spatial details of color? Well, that meant you didn't need to send very detailed color information, so the color (or "chroma") signal didn't require a lot of bandwidth, as long as the brightness (or "luminance") bandwidth was high.

Piggyback

But where, oh where, could you put the chroma signal? The answer lay in a bit of spectral cleverness. Television, being a repeating phenomenon—each line repeats at the same rate, no matter what's in the picture—had most of its spectral energy in repeating clumps of frequencies, with very little energy in between them. It was decided that a subcarrier signal (a carrier riding on the luminance signal) could carry the color information. By carefully choosing the frequency of the subcarrier so that it didn't divide evenly into the line rate, the spectral holes could be filled with the color signal. In theory, the two wouldn't interfere with each other!

In theory. In practice, if a signal is there, it's there, and you'll see it. Due to the deliberate nonharmonic nature of the chroma vs. line rate frequencies, the real effect was that each line of video had most of the chroma peaks and valleys in different places, and each frame had them opposite to the last one. The result was that the color signal appeared as a slight herringbone pattern, hard to see because it tended to average out over two frames. If you want to see what it looks like, get a black-and-white TV with a manually adjustable tuner, and turn the fine-tuning control in the direction of maximum picture sharpness (usually clockwise). Keep turning it a little more, and you'll see the herringbone pattern. You may also see squiggly lines that move with the audio portion of the broadcast, because another subcarrier carries the sound, using FM.

Exactly how the color information for the entire visual spectrum is encoded onto one subcarrier is a fascinating topic, and we'll explore it next time. Until then, 73 de KB1UM.

Number 57 on your Feedback card

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors Inc.
P.O. Box 131646
Staten Island NY 10313-0006

Visiting local schools

It's always nice learning about what hams are doing throughout the country to help promote amateur radio to young people. It's important to share ideas with each other so we can all benefit from the successes we've been fortunate enough to achieve. My friend Bob Raffaele W2XM from Albany, New York, has always been interested in getting children involved with the hobby. He recently sent me the following article he wrote in hope that readers of this column would get some ideas that they could use in their local schools.

Bob writes: "Most of us get so much satisfaction from ham radio that we want to share it with those who are not yet involved. For those who want to make a presentation to school-aged kids, I hope this encourages you. School kids are curious and quick to learn. However, there are obstacles. In general, kids are more than a little impatient and undoubtedly hard to impress. I've dealt mostly with 6th graders. They know about cellular phones and the World Wide Web; they will not be awed by a demonstration of your HT and a description of the DX you can work from home.

"Hams communicate via keyboard and CRT, voice, telegraphy, and television. They talk with astronauts, DXpeditioners, and fellow hobbyists of all ages. Hams are pioneers in communications technology; they assist in emergencies; and many have rigs, and HF or packet stations, right in their cars. To help children to appreciate our world of amateur radio, we'd like to teach them about all these things... and more.

"In our enthusiasm, however, we sometimes have a tendency to cause kids to expect more than we can deliver at the moment. Let's not build up their expectations, only to let them down. There is no sadder sight than a classroom full of disappointed middle-schoolers. Playing it safe, this presenter uses 40 SSB, 15 SSB, and 2m FM for most live demonstrations. On-the-air QSOs are only a small part of a comprehensive lesson on ham radio.

"Nathaniel KB2HPX and I have planned a presentation that fills two to three hours on each of two days. I've adapted this lesson for 6th graders because at this grade level they know enough geography and math skills to benefit from the interactive learning."

Bob goes on to explain that since he and Nathaniel teamed up to do their presentations in local schools in 1992, they've been very well received. But recently the demand for them in the classroom has decreased. They seem to have met up with what many of us in the classroom are starting to encounter... the inevitable comparison to the very popular Internet.

We who are concerned about the recruitment of young people into ham radio need to be ready to change our old motivation techniques when they really don't work like they used to.

Bob continues: "On-line access to information and pictures, and the ability to transfer large quantities of data quickly and reliably, are aspects of communications where the Internet beats amateur radio hands down (as long as electrical power and telephone service are available and uninterrupted). The Internet is an appliance; many people use it, but few understand it. Ham radio is a communications service and an educational hobby that can be so totally engrossing it can easily become a 'way of life.'

"Perhaps an environment in which both newcomers and veterans are being enriched and in which technology is being advanced should be called a very successful educational institution, and not just a 'hobby.'

"Here's a lesson that works well in a classroom and includes operating a low-band rig. Forty meters and 15 meters are the bands of choice. The antenna is a 40m dipole, modified to enhance dual-band operation.

"With hand-held rigs, small antennas, repeaters allowing distant contacts, autopatches, and local hams standing by to encourage the kids, a 2-meter contact can be great. Our VHF antenna is a vertically-mounted coaxial dipole that is placed outside. The antennas should be installed and tested before the demonstration.

"Kids will be intrigued to find you talking on the air as they enter the classroom that day. Using this 'teaser' as an introduction is a good idea only if the demonstrator is not performing solo. Someone has to explain what is happening.

"It is explained that the only things required for the exchange of voices are invisible radio waves and devices to emit and capture them. A display of antennas can be set up so the students can see that ham antennas need not be expensive or large and cumbersome.

"Students can calculate the lengths of the antennas with the help of formulae that you provide. You can teach the meaning of 'frequency' as being a 'location on the dial.' Once 'frequency' is in their vocabulary, the kids are ready for some algebra and division: Let the math begin!"

W2XM has learned to work with the teacher to include amateur radio in other curriculum areas. Any reader who wants lesson plans to use in different subject areas can write to this "Hams With Class" column or to Bob Raffaele at E-mail: bobw2xm @tu.albany.ny.us.

Bob and Nathaniel have learned to use QSL cards and the "Archie" comic book published by the ARRL in their presentation. They seem to have mastered the importance of doing lively demonstrations, keeping the pace fast, and having lots of visual materials for the children.

Bob has so many good ideas to share about his experiences in the classroom. We wish him continued success as he continues to persevere in trying to reach youngsters in local schools. 73

HFx™

Here's what people are saying about the best propagation software available:

This is a cool product! – *Ham Radio Online*

HFx will become a powerful force in the field of HF-propagation prediction and analysis. – *QST*

HFx figures among the most complete and best developed prediction software tools. – *Megahertz*

Very intuitive and visual . . . easy to understand! – *CQ (Japan)*

It's uncanny how accurate (HFx) is! – *N9VHW*

Check out our web site for more information. Take the guided tour or download a demo copy and try it out yourself!

http://www.psrv.com/hfx/

For more information or to order, call or write us at:

HFx-73
Pacific-Sierra Research Corporation
2901 28th Street, Suite 300
Santa Monica, CA 90405-2938, USA

1-800-820-4PSR
FAX: 310-314-2323
Outside the U.S. & Canada:
310-314-2300
E-mail: hfx%mgate@psrv.com

Visa and MasterCard accepted
$129.00 postpaid worldwide

CIRCLE 226 ON READER SERVICE CARD

ATV

Ham Television

Bill Brown WB8ELK
139 Angela Dr. Apt. B
Madison AL 35738

California balloonin'

During a recent visit with Mike Henkoski KC6CCC in San Clemente, California, I had the opportunity to participate in a unique experiment. Mike had designed an FM ATV transmitter and amplifier for the 2 GHz band. Now he wanted to use a high altitude balloon flight to test out the range of his 1-watt transmitter in combination with his latest ground station configuration. Back in November he had flown just such a transmitter onboard a rocket that sent it up to 53 miles high above the Black Rock Desert in Nevada with phenomenal results (watch future columns for the story).

"As the wind gusted, Lisa nearly went for a ride!"

The payload

Mike's payload was a very lightweight Styrofoam™ package (2 pounds total) consisting of a small exciter board on 2.442 GHz, a 1-watt amplifier, a homebrew circular patch antenna on the bottom of the package and a color TV camera (Computar pinhole). Four D-size lithium cells [made by SAFT, available from Avex Electronics (800) 345-1295] provided power for the system to give him nearly seven hours of operating time. *Note: The 2 GHz transmitter and amplifier are products designed for commercial surveillance and retuned for the amateur band. For more information on these products, check out their Web site at: http://microtekelectronics.com.*

The ground station

The receive setup consisted of a 60-inch satellite dish originally designed for the Ku band [KTI brand with an F/D of 0.41, available from Skyvision (800) 543-3025]. Mike mounted a Microtek 2 GHz receiver board on the dish along with a Tecom dual-patch circularly-polarized antenna located in its focal point, designed to slightly underilluminate it.

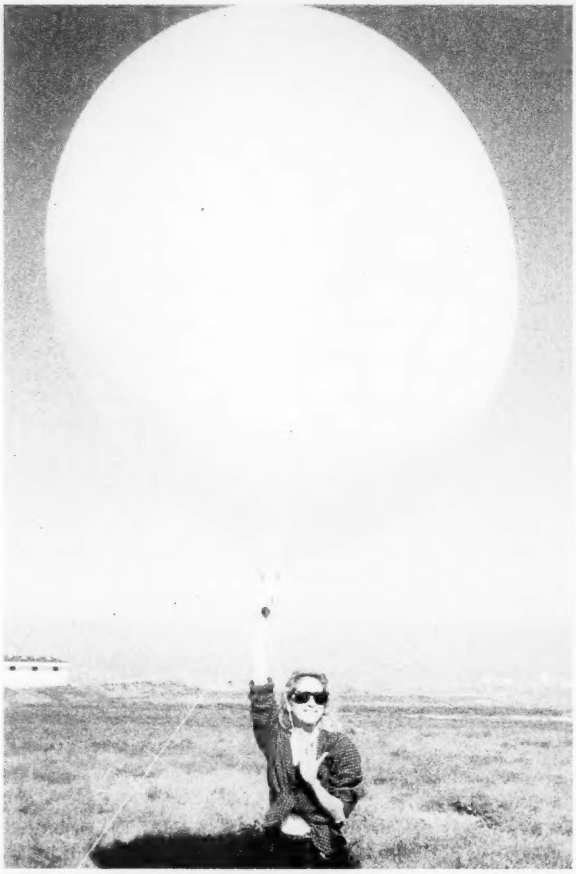


Photo B. *Lisa Taylor prepares to launch the balloon from a park near San Clemente.*

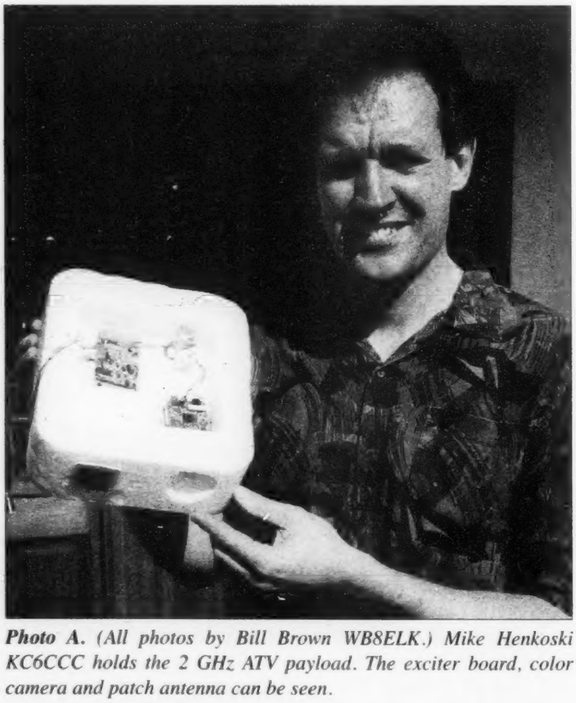


Photo A. *(All photos by Bill Brown WB8ELK.) Mike Henkoski KC6CCC holds the 2 GHz ATV payload. The exciter board, color camera and patch antenna can be seen.*

The flight

February 1st turned out to be a typical sunny California day just perfect for launching a balloon. Mike KC6CCC, Duane Snipes WB6GGF, Bill WB8ELK and Lisa Taylor set out for a park just east of Mike's house to set up the ground station. In addition to the 60-inch dish sitting next to Mike's truck, we were able to link the launch (as well as the received downlink from the balloon during the flight) to the KC6CCC ATV repeater on top of Santiago Peak. This unique all-microwave repeater operates with an input on 10.4 GHz and an output on 3.480 GHz and will be a subject for a future column. Mike linked the launch activities up to the repeater via a special link receiver on 2.418 GHz. To cover the majority of ATVers in the region, one of the local ATVers took the output of Mike's repeater and retransmitted it out via the WA6SVT ATV repeater (also located on Santiago Peak with a 434 input and 1253.25 output). The flight coverage would involve two ATV repeaters and four frequency bands!

As Mike and Duane set up the ground station and tested the links to the ATV repeaters, Jim Porep KC6TFV and Curt Toumanian N6TWB (our chase crew) arrived on the scene. We started the balloon inflation and final checkout of the payload. Just before liftoff, Lisa (holding the balloon) nearly went for a ride herself as a couple of wind gusts kicked up. Fortunately, things quieted down and the balloon took off nicely without her.

Photo C. *(l to r): Mike KC6CCC adjusts the receive dish while Duane WB6GGF and Lisa watch the downlinked video.*

Although the package was spinning around quite a bit (Dramamine will be in our travel kit next time), the transmissions from the balloon were snow-free most of the time and in beautiful color. As the balloon gained altitude, we could see the California coastline from San Diego to Malibu, as well as several islands, including Catalina. Just before the balloon burst at an altitude of around 95,000 feet, we could clearly see the blackness of space and the curvature of the Earth. We could see a large portion of southern California extending from Malibu all the way to the Salton Sea. Even though the payload was well over 50 miles away, the reception was still snow-free a good deal of the time, with some deep fades. Although the large dish had a narrow beamwidth, it was possible to bring in a great picture most of the time.

When the balloon burst, we could see the package flip over and saw bits of the balloon fly past the camera. The parachute descent was smooth and we were all amazed at just how low on the horizon we could still see decent video. Apparently the signal was "knife-edging" over a nearby range of mountains, and we could see a snowcapped mountain and a small town below the payload just before it landed.

Using cross-bearings from the launch site, Mike WA6SVT's QTH, and the chase crew, we determined that the payload had landed in a particularly rugged area just east of Santa Rosa Mountain, about 10 miles south of the town of Anza. Unfortunately, it has not been recovered as of this writing.

Although the payload was lost, the flight was certainly a successful demonstration of the capabilities of microwave FM TV.

Photo D. *(l to r): Jim KC6TFV and Curt N6TWB prepare to chase the payload with their mobile 2 GHz ATV receive station.*

NEVER SAY DIE

Continued from page 47

mountain climbing
music: reading music
music: playing an instrument
music: familiarity with classics
music: familiarity with opera/ operettas
orienteering
parachuting
photography
ping pong
poetry .
printing
public speaking
rallying
repairing household stuff
rollerskating/blading
running
scuba diving
sculpting
sewing
skiing
skydiving
snowboarding
soldering
speed-reading
spelling
spelunking
surveying
swimming
tennis
tree pruning
tumbling
typing
ultra-light flying
video making & editing
water-skiing
welding
whittling
woodworking
wrestling
writing

The Sudbury Valley School doesn't have the equipment needed for kids to learn most of the above skills, so they encourage the kids to apprentice out to learn. As there are more schools like this my sneaky plan for setting up mobile laboratories which could make the equipment and teachers available to a number of schools would be practical.

Kids interested in learning about woodworking could sign up to use the equipment in the woodworking trailer when it's parked for a week or so at the school. Ditto other skills

Continued on page 61

AMATEUR TELEVISION
Web site: www.hamtv.com

GET THE ATV BUG

≥10 Watt pep
Transceiver
Only $499
Made in USA
Full Color
and sound

TC70-10 420-450 MHz ATV Transciever

ATV is no more difficult to get on vs. any voice mode except you just plug in your camcorder to transmit, and your TV set to receive the picture and sound. That's it - you're seeing as well as talking to other hams live and in color. No other radios, computers or interface boxes required.

DX is 90 miles snow free line of sight using 14dBd ant.

Show the shack, home video tapes, zoom in and describe projects, show computer graphics or programs, repeat SSTV or even Space Shuttle Video and audio if you have a TVRO. Go portable or mobile, do public service events, RACES, AREC, CAP, transmit the local radio club meet.

HAMS; Call, Write or Email for our 10 page ATV Catalogue for more info - We have it all! Transmitters, Downconverters, Amplifiers, Repeater modules, and more. We also have wired and tested boards for the builder, R/C, Rocket and Balloon ATVers.

(818) 447-4565 M-Th 8am-5:30pm pst Visa, MC, UPS COD
P.C. ELECTRONICS
Email: tomsmb@aol.com
24 Hr. FAX (818) 447-0489
2522 Paxson Lane Arcadia CA 91007

QRP

Number 60 on your Feedback card

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

April showers bring May flowers, but they also bring the Dayton Hamvention©! This year, the QRP forums will be larger than ever. Last year, we completely filled the banquet room on Saturday night!

Here's this year's information directly from the source, Bob Gobrick VO1DRB/WA6ERB, FDIM Publicity Chairperson:

Four Days In May QRP Symposium—the amateur radio QRP event of 1997

The QRP Amateur Radio Club, International (QRP-ARCI) proudly announces the second annual Four Days In May QRP Symposium to be held on Thursday, May 15, 1997—the first of the four festive days of 1997 Dayton hamvention QRP activities. Mark your calendar for this extra bonus day and register early for this not-to-be-missed QRP event of the year.

Amateur radio QRP presentations, workshops and demonstrations will be the focus of the full-day Thursday activities to be held at the Days Inn Dayton South (513-847-8422). Last year, this sold-out event had a "standing-room-only" crowd of 100 enthusiastic pre-registered attendees. For 1997, the FDIM QRP Symposium will be moved to the hotel's larger ballroom facility, so make your reservations early before it is sold out again. FDIM QRP Symposium attendees will start their day with a wake-up coffee social and then plunge into a morning of multimedia QRP presentations by renowned QRP authors and designers. At midday, attendees are treated to a catered lunch and QRP door prizes. Then it is back to an afternoon of exciting QRP technical presentations. Topping off this first day will be an evening of guest QRP tutorials sponsored by regional QRP clubs. The 1997 Four Days In May QRP Symposium will be the talk of the 1997 Dayton hamvention.

The Four Days in May QRP extravaganza then continues with the annual Friday night QRP-ARCI Awards Banquet honoring QRP dignitaries for their service to the amateur radio community. Following the awards banquet, a special evening has been set aside for the FDIM QRP Vendor Social where prizes will be drawn. Saturday will also be special this year with an evening for QRPers to meet the many regional North American and international QRP clubs—bring your banners! QRP Club awards will be presented to those who submit their pride-and-joy QRP construction projects for judging.

> ***"Last year, this sold-out event had a 'standing-room-only' crowd of 100 enthusiastic QRPers."***

Four Days In May QRP Symposium: frequently asked questions

• QRP Symposium Presenters—Please submit your QRP technical manuscripts to FDIM Technical Paper Chairperson Bruce Muscolino W6TOY/3 at P.O. Box 9333, Silver Spring MD 20916-9333; E-mail: w6toy@erols.com. Presenters' papers will be bound into the 1997 FDIM QRP Symposium *Proceedings*. All attendees receive the *Proceedings*.

• FDIM QRP Symposium Registration Fee—Registration for the Thursday, May 15, 1997, FDIM QRP Symposium will be $30 if prepaid by May 1, 1997, and $35 after that date or at the door. At the door, registration may be limited if we once again sell out. Please register early to guarantee a seat. Registration will cover a full day of QRP Symposium activities, which include the QRP technical presentations, the 1997 FDIM QRP Symposium *Proceedings*, the scrumptious QRP luncheon, those famous "special" Symposium bag stuffers and, finally, an endless QRO coffeepot.

Please send your $30 registration fee (US check, money order, or international money order) made out to "Bob Follett" by May 1, 1997, to: Bob Follett AB7ST, FDIM Registration Chairperson, 2861 Estates Dr., Park City UT 84060. E-mail: bfollett@ditell.com.

• QRP-ARCI Awards Banquet—This not-to-be-missed Friday, May 16, 1997, event is once again being hosted by FDIM Banquet Chairperson Pete Meier WK8S. Please send your $15 banquet ticket fee (US check, money order, international money order) made out to "Pete Meier" by May 1, 1997, to: Pete Meier WK8S, 4181 Rural, Waterford MI 48329. E-mail: pmeier@tir.com.

• FDIM QRP Vendor Social—A tradition was started at FDIM 1996—a special evening was established to officially introduce our QRP vendors from around the world. All are invited to attend this wonderful Friday, May 16, 1997, evening social. Preston Douglas WJ2V will once again be our gracious host. QRP vendors: For registration information, please contact Preston Douglas WJ2V, QRP Vendor Evening Chairperson, 216 Harbor View N., Lawrence NY 11559. E-mail: pdouglas12@aol.com.

Bob Gobrick concludes: "On behalf of the entire FDIM team, I invite you all to join us for the QRP event of 1997—the Four Days In May QRP Symposium at the 1997 Dayton hamvention. Questions? My E-mail is 70466.1405@compuserve.com. See you all there!"

So there you have it—all the information you need to join us next month. I highly recommend the Four Days in May for all QRP operators. And don't forget: While you are enjoying the Four Days in May, your wife can be off happily shopping at the Dayton Mall. It's within walking distance of Days Inn South!

Rooms for Dayton

As in the past, Myron is handling the rooms for the hamvention. You can contact Myron at (330) 477-5717 to inquire about the status of open rooms. There is usually a waiting list, so don't wait too long.

QRP-ARCI dues

One more time, just in case you missed it: The cost of joining the QRP-ARCI is $17 for US hams. To renew your membership, the price is $15 for US hams. New membership for Canadian hams is $20; renewals, $18. DX members: the price of new membership is $27; renewals, $25. Remember, though, that these prices include air mail delivery of *The QRP Quarterly*. Send your renewal or new membership request to me at P.O. Box 508, Massillon OH 44648.

There are no special forms to fill out. All I need is your check or money order and your address. Watch your handwriting, though, please: make Us and Vs look like what they are supposed to be.

If you were a member years ago, be sure you let me know. If you don't, you'll get a new membership number. So if you joined the club in 1972, please include your old QRP-ARCI number. Remember, you are a member for life in the QRP-ARCI.

Net worthy

Much to the displeasure of my wife, I keep way too much paper lying around the house. So, to prevent drowning in any more, I've started to surf the World Wide Web in my search for technical data.

If I'm looking for datasheets on semiconductors, I start by pointing my Web browser at Harris Semiconductor. They are at: www.semi.harris.com.

Looking for a special-purpose IC? How about a battery charger chip for your latest QRP rig? Then by all means check out Maxim products. They specialize in portable (low current) ICs and are on the World Wide Web at: www.maxim-ic.com.

Micrel Semiconductor also has its own Web page. They are located at www.micrel.com. Micrel handles low drop out regulators, power supply control chips, and power MOSFET drivers.

Need something from Texas Instruments? Then check 'em out at www.ti.com. On the other hand, if you have no idea where to find that special or unusual part, then a peek at the *EITD* online (the *Electronic Industry Telephone Directory*), with its 30,000 listings, is a must. *EITD* is hiding with *Electronic Component News* at: www.ecnmag.com/eitd.

> ***"That shoots my 'paperless' shack in the butt, doesn't it?"***

Most of the Web sites have the datasheets for every part that the specific company makes. You can usually view these datasheets online. However, I like to download them for later use. If you do, you should know that the datasheets are stored in different formats.

By far the easiest to use is Adobe Acrobat. It's free and easily obtained at a zillion sites on the Web. Most of the time, you can get a copy at the same time you download the data files. The best part about Adobe Acrobat is its ability to download a datasheet from the Web for use on either Macintosh-format or Wintel machines. Of course, Adobe Acrobat allows you to print out datasheets, too, if you desire. Then again, that shoots my "paperless shack" in the butt, doesn't it?

Next month

I have a special project for you the next time we meet. I'm not going to tell you that you won't be able to live without this, but it is a lot of fun to build and really does something useful. As a matter of fact, it's not so much a project to build as it is a learning experience…

Until next month, see you at Dayton Hamvention 97!

NEVER SAY DIE

Continued from page 59

requiring specialized equipment and teachers.

In God's Image

Hmm, here goes Wayne again, stirring up the religiously inspired. The ARRL is absolutely right, amateurs should not discuss religion or politics, because in these areas belief is stronger than reason. Indeed, belief is so strong that many people can't tell it from reason, so any attempt at reasoning just makes them angry.

Well, that's never stopped me from upsetting people before, so why should I start now?

The *Bible* says man is made in God's image. Naturally women have a bone to pick over this. Maybe a rib. But since every person is different, I don't understand the "image" concept. Are we talking a Japanese Sumo wrestler? A Hottentot? Liberace? Tom Thumb? Are we talking a one-month-old zygote or a 120-year-old woman?

The people who die and go to heaven, and then come back (NDEs), are consistent in reporting that there is a God, though for some strange reason they seem to lose any interest they'd previously had in the organized religions. None of their reports mention anything about God being in man's image. Or woman's.

Well, we've made an enormous amount of scientific progress in the last hundred years, but little spiritual. Most of our major religions are based on ideas 1,500, 2,000, 2,500, and more years old—ideas expressed in the *Bible*, the *Koran*, the *Talmud*, the *Baghavad-Gita*, the *Vedas*, and so on. I've been reading some very interesting books about how these ideas developed, but I'm sure that devout believers in any of these sacred texts would get very upset from reading about their history.

Okay, so stone me as a heretic. My ancestors were thrown out of Scotland for being religious nuts. They moved to Ireland, becoming the Scotch-Irish. The Irish put up with their baloney for a while and then they, too, threw them out. So they came to America.

How does God handle the billions of other solar systems in our galaxy? And the billions more solar systems in the billions of other galaxies? Did God have a father? If not, where did God come from? Everything has to have a beginning. If there really was a big bang (and the more you look into that whole idea, the less water it holds), was God there before it? So what was God busy doing before there was a universe?

If our universe is expanding, what's it expanding into? Is Earth expanding too? If the universe is expanding, wouldn't Earth have to also be expanding, right along with it?

Now I can see why I should write about DXing instead of religion.

Von Däniken. Again!

Yes, I know, you're a whole lot more interested in who won the last ARRL Directors' election than reading or even thinking about the Sphinx. After all, the professional Egyptologists already know everything there is to know about the Sphinx, right? And the pyramids, too.

Well, having visited the Sphinx a couple of times, and having read more and more about it recently, I no longer trust the opinions of the professional Egyptologists as to its age.

Erich von Däniken's latest book, *The Eyes of the Sphinx*, is a fun read about ancient history. And it's very well documented. He demolishes the experts (a.k.a. prestigious scientists) on the Sphinx and the pyramids.

For instance, none of the experts have come up with a reasonable explanation of how the pyramids could have been built. Von Däniken discusses all of the proposed theories, and destroys them. He cites the theory of Professor Davidovits, an archeological expert, who says the giant stones were not quarried miles away and brought to the site, but were poured, just like concrete. A set of hieroglyphs found in 1889 described the manufacture of the concrete, listing 29 minerals (and where they could be found) and several natural chemicals as the ingredients. When Professor Davidovits mixed up a batch of this cement according to the old recipe, he got a harder concrete which dried faster than modern concrete and was much more

Continued on page 63

WE DON'T BUILD THE MOST,
WE JUST BUILD THE BEST!

- Our LM-470D is now redesigned to hold 15 ft. of antennae at 70 mph!
- Tri-Ex builds the finest in crank-up, free-standing or guyed towers.
- All towers are complete with rigid concrete base mount.

CALL OR WRITE FOR A FREE CATALOGUE!

VISA
MasterCard

Tri-Ex®
TOWER CORPORATION
7182 Rasmussen Ave. • Visalia, CA 93291
Where engineering and quality come first!

TO ORDER CALL 800-328-2393
FAX 209-651-5157

CIRCLE 22 ON READER SERVICE CARD

Number 62 on your Feedback card

CARR'S CORNER

Joseph J. Carr K4IPV
P.O. Box 1099
Falls Church VA 22041
E-mail: carrjj@aol.com

Depending on when you read this, the annual science fair season is either in full swing or just completed. Every year, in most localities, there is a round of science fairs that progresses from the school level to an area fair, to a regional or state fair, up to the international fair. At each level there is a sorting-out process in which some students are selected to go forward and others are not (we never say "lose" because that's not the issue). I usually judge three to six fairs depending on my available time. This year, I did not do as many as in the past because I teach Visual BASIC (a computer language) on Saturday mornings at our local community college.

If you have any technical ability, or if you are trained in any of the sciences or mathematics, then I recommend that you get involved in science fair judging. It's really rewarding to see kids who work in a disciplined manner to ferret out some bit of truth about Nature. While few of them will ever earn a Nobel Prize, or even take up science as a career, there is a distinct learning process going on. Students who negotiate the rigors of even high school science learn to think critically, and to organize facts and data.

Science fairs are not only personally rewarding, but they can also steer youngsters into amateur radio. Perhaps your local club ought to sponsor a special prize, a scholarship, or even just a certificate for the "best of fair." It would certainly get some publicity for the hobby. It would especially be useful if the prize is restricted to students who do something related to radio, or who are amateur radio operators, or something else that is relevant. Most science fairs have a time for special judging by professional societies and other interested groups. The local fair coordinator can get you the information.

If you are a high school student, or have a high schooler in your household, or know and mentor (Elmer?) a student, then you might want to copy the material below and put it to good use.

Winning a science fair

Science fairs are about science, so scientific method counts for a great deal. When I wrote about this subject one time before, a reader (of a different magazine) wrote me a harsh letter and complained that a young friend had been rejected at a science fair because she did not have a stated hypothesis. The claim was made for her that the project was a perfectly valid environmental project and was based on good data. It probably was, but if it doesn't have some hypothesis at risk, then it is doubtful science at best.

> ***"If it doesn't have some hypothesis at risk, then it is doubtful science at best."***

A hypothesis is a falsifiable statement of what you are looking for. The term "falsifiable" means that it is capable of being proven false. Indeed, it is often easier to falsify a null hypothesis, i.e., the statement that something cannot occur, than it is to falsify the hypothesis itself. Here's one example. Suppose the hypothesis is that "All cats are gray in color." You can inspect 10,000 gray cats and still not be sure that all cats are gray. Even a single not-gray cat disproves the hypothesis. The example is trivial, and a bit weak, but you get the idea.

Another example—but please, please, please don't try this experiment at home. Suppose the hypothesis is: "Kerosene in an open dish cannot be ignited by tossing a lighted match into it." You can toss a thousand matches into it and see them doused without knowing for sure that the hypothesis is correct. But, if you rephrase the question to: "Kerosene in an open dish can be ignited by a lighted match," a different situation is found. If a single match lights off the kerosene, then the original hypothesis ("cannot") is falsified.

The hypothesis should be written out before the experiment is designed and conducted. Furthermore, when planning the experiment, decide what data constitutes sufficient proof of the hypothesis and null hypothesis. If data collection involves some ambiguity, make a prior decision on how to count each datum. For example, if the relevant data are temperatures, and you classify "above 100 degrees" and "below 100 degrees," then specify beforehand where readings of exactly 100 degrees will go. Some people will place all of the exact readings in one class or another, while others alternate back and forth (i.e., the first 100 degree reading goes in one class, the next in the opposite class). Still others randomly assign the data point to one class or the other.

Do enough trials of the experiment to ensure that the results are significant. Doing three or four trials is probably not sufficient. Perhaps 20 or 30 is better. No one expects high school students to have the resources and time to do some more complex experiments with the number of repetitions that statisticians would like—or that professional scientists would use—but "only a few" is clearly suspect.

It is also critical to do your own work. While that should go without saying, there are always those who have someone else do the work and submit it as their own. Sighhh. Of course, sometimes judges make errors. I recall one youngster, whom I knew personally, who built an electronic project too well. Some judges claimed that he had to have had his father do it for him, because the quality of construction was too good. But I knew the kid had done a lot of projects other than the science fair project, so I intervened and convinced them that his father did not do it. Indeed, he probably didn't know how—he was an accountant with no amateur radio or hobbyist electronics background. The kid's project might as well have been in Greek for all his father knew about it (same with the boy's mother).

Another good trick is to keep a complete notebook on the project. Professional scientific or engineering notebooks are available, but are too costly for most high school projecteers. The standard in science is to use a bound notebook so that other people can tell if pages—perhaps *embarrassing* pages—were removed. One of those speckled black and white "composition notebooks" is just fine at the high school level.

Make all entries in the notebook in ink. Do not attempt to erase erroneous entries. Cross them out, in ink, note the date of the correction, and place your initials by the correction. Close to the same spot write in the correct data, if available.

Make good use of statistics. If you don't know anything about statistics, then get an introductory book. I can immodestly recommend my own book: *The Art of Science*. It has a lot of very good information for the budding scientist, and is well within the intellectual reach of even average high school students. That old bromide about "you can prove anything with statistics," meaning that you can propagate rubbish, or "there are liars, damn liars and statistics," is essentially hogwash. There is only good use of statistics and bad use.

Also, learn what "significant figures" means. If you measure a potential of 1 volt and a current of 3 amperes with the usual measuring instruments, the answer R = E/I = 1/3 is not "0.333333333" (or however many digits your calculator can carry), but "0.33" or "0.333" at most; in some cases, it might even be "0.3." The judges are not only not impressed with such seeming precision as "0.333333333," but might be sufficiently *un*impressed to count off significant points for such sloppiness.

The display that you prepare should be as nice as possible. If you have the resources, use your computer graphics and word processor programs. Mount everything on foam-backed poster paper (or even use one of those three-panel "science fair" displays made from foam-backed poster paper). If you don't have the resources, then hand write—or print—everything as neatly as humanly possible. Judges are generally not impressed enough with the display to award a higher place for bad science, or reduce the place for good science, but in borderline cases the display can make the difference. And if you are good enough to go to the regional or state science fair appearance becomes a lot more significant. At that level, all of the competition is good.

Above all, know your subject and be prepared to answer some questions. If you don't know the answer, then don't try to scam the judge—it won't work. "I don't know" is an acceptable answer if it is the truth, especially when followed by "...but I intend to find out." The essence of good science is the Confession of Ignorance, coupled with the integrity to admit it out loud, and the energy to go find the answer. After all, the professional scientist spends most of his or her time out on the frontiers of knowledge, and out there Nature is very unforgiving of a "know-it-all" attitude. *"Y gwin erbyn y byd"* ("Truth prevails against the whole world"), the war cry of the Iceni (Briton) Queen Boudicca (ca. AD 61) applies to science—but only for those who have the integrity to seek it out.

New book for computer types

If you are into programming or building computers, whether for control of amateur radio, some other practical project, or just for yuks, then there is a book that you need to see. Have you noticed all those accessories that work off the parallel printer port? There's a gazillion of them. Ever wondered how they do that trick, and how you could do it? Then take a look at *Parallel Port Complete* by Jan Axelson. It contains the hardware and software details for programming and interfacing to the parallel port. I've got a copy to review, and it looks great! It can be bought for $39.95 (includes Visual BASIC diskette), and is available from Lakeview Research, 2209 Winnebago Street, Madison WI 53704; phone: (608) 241-5824; FAX (608) 241-5848; E-mail jaxelson@lvr.com. The cover image and additional information can be found at Web site http://www.lvr.com/ppcpress/htm.

Radio Bookshop

Phone 800-274-7373 or 603-924-0058, FAX 603-924-8613, or see order form on page 88 for ordering information.

How to Generate $1 Million In Extra Sales.

In this video Wayne explains how almost any company can generate lots more sales using PR instead of advertising. Learn the secrets of how to write and get your PR releases published. Learn how to get product reviews which are pure gold for sales. Not one company in the ham industry is taking full advantage of the power of PR. This is something most ad agencies know little about. The video is a paltry $39.95.

World's Fastest Code Course

The old, hard way, to learn the code is to start slow and gradually speed up. In that direction lies madness. The Blitz Method is to start at 13 or 20 wpm immediately. Yes, tapes are available to help. Use T-5 to learn the characters. T-13 will get your General ticket with a few hours work. T-20 ditto for Extra. The tapes are $7 each and are as nasty as Wayne could make them.

Cold Fusion Journal

Try a 12-issue subscription for $50. This is going to be one of the largest industries in the world in a few years, and the ground floor is still open.

NEVER SAY DIE

Continued from page 61

resistant to environmental factors. It wasn't long before a French company started making concrete using this old recipe, and Lone Star has introduced the harder, faster-drying mix in the U.S.

A microscopic examination of a rock sample from the Great Pyramid by Davidovits turned up traces of human hairs.

You can see why I found the book so fascinating. It's published by Berkley Books, ISBN 0-425-15130-1, 278pp, $12.

Von Däniken makes a good case for the Sphinx being up to 10,000 years older than believed by the experts, and the same for the Giza pyramids. The experts disagree, mainly because they say that the technology required to build these enormous structures was impossible that early.

Encouraged and excited by this book, I next tackled Zacharia Sitchin's *When Time Began*. This Avon pocket book runs 410pp, ISBN 0-380-77071-7, and costs only $7. I've got four of Sitchin's books to read. He's done an amazing amount of research in archeology and ancient texts and his books are thoroughly illustrated with these references, so his interpretations of history seem well founded. Interesting stuff, and not what you're taught in school.

It is upsetting to Egyptian historians to admit that the major Egyptian monuments predate Egyptian civilization and thus have to be the product of some other people. Or maybe non-people (aliens).

Oh well, I'm sure that there's no possible connection between endless ancient texts about aliens and the current spate of abduction reports, UFO sightings, the shadowy figures behind the Fed, the Council of Foreign Relations, the Bilderbergs, the Illuminati, and so on. That's all the usual conspiracy hokum. No, let's ignore all that nonsense and worry about the sunspot cycle and when our HF bands are going to come back to life.

Weird Forces

Von Däniken, in his new Sphinx book, explains how the "pyramid effect" was discovered by Antoine Bovis in the 1930s. This is the strange effect which

Continued on page 81

Bisme Computers

100% Satisfaction & Every day Low Price Leader

ALL Motherboards w/CPU:

486 DX2 66 /100MHZ w/256K $119/139

586 DX133 MHZ COMBO w/256K $145

686 P90+ PENTIUM w/256K $165

686 P120+ 256K PCI $239

Orders & PRICE

Tel* 800-899-6430

Fax* 209-538-3940

Free Tech Support

800 899 6430

Floppy Drives :

1.44 MITS $20

1.2 TEAC $32

1.2/1.44 COMBO $65

VISA

HARD DRIVES SPECIAL

540MB/1.27GB $129 /189

1.6GB/2.1 GB $189 /209

2.5GB /3.1GB $269 /299

Monitors:

14" MONO.VGA $89

14" .28 108 NH, $219

15" .28 1024x768 $299

17" .28 1280x1024 $525

Member of Better Business Bureau

P166+

Faster than Pentium 166Mhz

$279

MasterCard

Keyboards: $12

VGA Cards:

SVGA 1MB $35

VESA/PCI 1MB EXP 2MB $39

PCI / VESA VGA 2MB $55

Resellers Dealers Welcome

Memory

Will beat any price

LOW $$$

16Bit Sound Card $29

10X Speed CD $99

12X Speed CD $125

16X Speed CD $Call!

Modem/Fax Modem:

28.8 PCMCIA$149

33.6 FAX/MODEM$85

Any other Item

Please Call

All Pentium MMX

686 & 586 Mother Boards

Memory & Drives at Super Low Price

Bisme Computer, Inc 1443 Angie Ave, Suite C, Modesto, CA

CIRCLE 163 ON READER SERVICE CARD

Number 64 on your Feedback card

Ham Radio Fun

Communications Simplified, Part 16

Peter A. Stark K2OAW
P.O. Box 209
Mt. Kisco NY 10549

So far we've covered a few of the basic antenna types—the dipole, 1/4-wave vertical, and the yagi beam. Let's look at some more general concepts.

Types of feedline

When an antenna consists of two identical parts, such as the two halves of a dipole or the driven element in a yagi, it can be fed by a balanced line. The two sides of the antenna get equal, but opposite, voltages. For low-power applications, 300-ohm twinlead could be used, but for higher powers, or if line losses are important, an open-wire line is more common. This consists of two conductors, kept apart by insulated spacers every few inches. These spacers have less loss than the continuous strip of plastic used in the twinlead.

But when the antenna consists of unlike parts, such as a vertical antenna and its ground plane, you should use an unbalanced line, such as a coax cable. You can mix and match by using a balun to match a balanced load to an unbalanced line, or vice versa. With a transmitting antenna, however, you must be sure that the balun can handle the power. The balun can be a transformer, as discussed in our transmission line chapter, or it can be made from coax cable.

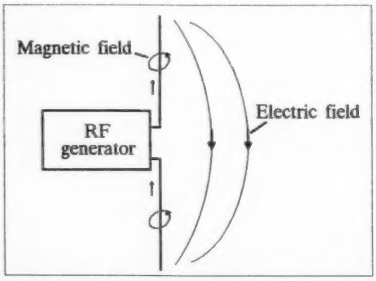


Fig. 1. Fields around a dipole.

People sometimes use a coax cable to feed a dipole; although this works, it greatly distorts the pattern of the antenna, because the coax shield now becomes part of the antenna, and itself radiates.

> ***"There is one concept, often forgotten, that is crucial to success."***

The counterpoise

In the electric and magnetic fields of **Fig. 1**, we specifically refer to a dipole, and we show the electric field extending from one end of the dipole to the other. A similar thing occurs with a vertical antenna, except that this time the electric field extends from the top of the vertical whip down to the ground plane under it, as shown in **Fig. 2**. In other words, the ground plane (and the coax shield it connects to) is an integral part of the antenna.

In general, any antenna that directly generates an electric field needs two parts between which the field can extend. If only one part of the antenna is up in the air, then the other part has to be down at the bottom somewhere, so it can act "against" the top part. It is therefore often called the counterpoise.

This is a concept often forgotten by amateur antenna builders, but it is crucial to success. If an antenna does not supply its own counterpoise (such as the other half of a dipole, for example), then an external counterpoise (usually grounded) must be provided.

Loop antennas

Two paragraphs ago, we used the phrase "any antenna that directly generates an electric field." There *are* antennas that do not.

We mentioned that radio waves consist of an electromagnetic field, which is a combination of an electric field and a magnetic field. There are antennas which generate (or detect) mainly the magnetic field; they let the buildup and collapse of the magnetic field generate the electric field which is ultimately necessary to transmit the signal through the air.

A simple example is the loopstick antenna used in almost all AM broadcast receivers. It is simply a short rod of ferrite (an insulating rod which contains metal powder), with a coil wound around it. As the magnetic component of the electromagnetic field passes through it, the coil generates a voltage. The advantage of such an antenna is that it can be quite small—even though a half wavelength at the AM broadcast band is on the order of 1,000 feet or so, the

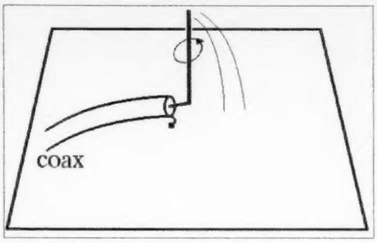


Fig. 2. Fields at a vertical antenna.

loopstick antenna is usually just a few inches long.

There are also several models of commercial loop transmitting antennas. They are not as efficient as some other antennas, but they feature small size. For example, a dipole antenna for the 20-meter (14 MHz) amateur band would be about 34 feet long; a loop antenna for that band is less than one tenth that size.

Collinear antennas

In introducing directional antennas, we discussed using multiple radiators whose signals add in some directions, and cancel in others. Our prior examples used radiators which were parallel to each other; these radiators could also be placed end to end, in which case the antenna is called a collinear antenna, because all the radiators are on the same line.

A common example consists of two or three vertical dipoles, placed one above the other. A receiver at the same height as the collinear transmitting antenna will get the sum of the dipoles' signals, but the signals heading for a receiver at a slightly higher or lower altitude will partially cancel. The effect is to take the dipole's normal vertical radiation pattern, and squeeze it. The normal radiation pattern wastes some signal by sending it down into the ground and up into the clouds; the collinear antenna reduces the radiation in those directions, and sends it out more horizontally.

Nonresonant antennas

You probably know that in a resonant circuit, the capacitive reactance and the inductive reactance are equal, and they therefore cancel. That is, a resonant circuit appears as a pure resistance because the reactance is canceled out. The antennas we've discussed so far in this chapter were resonant also; that is, their length (some multiple of a quarter wavelength) made them appear as a pure resistance load.

DETOUR

When you calculate the length of an antenna in wavelengths, remember to consider the speed of the signal in the antenna wire—the velocity factor. The velocity factor of a plain wire depends slightly on the diameter of the wire, but it is about 0.95, so a 1/4-wavelength antenna would be about 5% shorter than 1/4 of a wavelength in air.

END OF DETOUR

Many antennas, however, are nonresonant, or perhaps resonant at some frequency other than where we want to use them. This adds a capacitive or inductive reactance, which means that there will be some mismatch to the resistive Z_o of the line that feeds them. The common solution is to add just enough of a capacitance or inductance to the circuit to cancel out the reactance of the antenna.

"This trick is often used to shorten an antenna."

This trick is often used to shorten an antenna. For example, a 1/4-wave vertical antenna for the 27 MHz CB band would be about 102 inches long, a bit unwieldy for most mobile operators. The antenna can be shortened, but then it has a capacitive reactance. This can be canceled out with a loading coil (inductance) at the base or near the bottom of the antenna. Likewise, a 1/4-wave whip for a 2-meter amateur handie-talkie would be about 19-1/4 inches long; the antenna can be shortened but then appears capacitive. Many such radios use a rubber ducky" antenna, which winds the antenna in a coil and thus adds inductance to make it resonant.

The disadvantage is that this greatly reduces the efficiency of the antenna. Shortening an antenna by 50%, for example, reduces its efficiency by more than 50%. This doesn't matter much in most receive applications, but is important in a transmitter because the extra inductance tends to heat up and absorb power that should be transmitted.

Feed methods

So far, we've seen antennas with the feedline connected in the middle (as in the dipole or the driven element in the beam) and at the end (in the vertical antenna). Antennas can also be fed at other points, such as slightly off the middle, or at the 2/3 point. In general such antennas do not provide a resistive load, and so some extra capacitance or inductance is needed to make them a good load for the transmission line.

Modern cellular phone antennas are an interesting example of a combination of different feed methods to make a collinear antenna. Most mobile cell phone antennas look like **Fig. 3**. If we break down the antenna into its parts, we see a 1/4-wave vertical at the bottom, with a 1/2-wave antenna above it, making a collinear antenna. But the 1/2-wave antenna at the top is fed at its bottom end rather than in the middle like a dipole. A short inductor between the two antennas takes some of the signal from the bottom antenna and couples it into the top antenna.

Antenna gain

We have shown that directional antennas concentrate the power in a desired direction, and reduce the power going off in undesired directions. This implies that the directional antenna puts out a

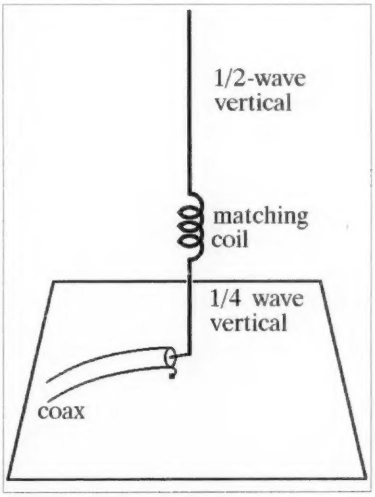


Fig. 3. A common cellular antenna.

stronger signal in its desired direction than a nondirectional antenna would. This improvement is called an antenna's gain. So if one antenna puts out a signal that is 3 dB stronger than that of a nondirectional antenna, we say that it has 3 dB gain. The catch, of course, is that we have to aim the directional antenna correctly.

Well, there is actually another catch, too. Every antenna is directional—there is no such thing as a truly nondirectional antenna, since even a simple dipole or 1/4-wave vertical transmits nothing off its ends. So to be able to do any meaningful comparisons, we have to invent a nondirectional antenna first.

Enter the isotropic antenna. This antenna is impossible to build, but it is useful to imagine it anyway. We assume that the isotropic antenna is (1) perfectly efficient, with no losses, and (2) perfectly nondirectional. All the power it gets from the transmitter is sent out into space equally in all directions.

So let's connect the isotropic antenna to a transmitter with some transmission line. If the power going into the isotropic antenna is P watts, then the Effective Radiated Power or ERP coming out of the isotropic antenna is also P watts.

The idea of ERP becomes important when we consider a directional antenna. Suppose the directional antenna aims its signal so that in some desired direction its signal is a thousand times as strong as the isotropic antenna would be. The word "effective" implies that only the power actually going toward the receiver is useful or effective, so the Effective Radiated Power of this directional antenna is then also a thousand times as large. A 1-watt transmitter feeding such an antenna would put out as strong a signal in this one desired direction as a 1,000-watt transmitter using an isotropic antenna; the 1-watt transmitter and its directional antenna would then be putting out an ERP of 1,000 watts. What this points out is that it is not a good idea to stand in front of a very directional, high-gain antenna, even if the transmitter power is fairly small, because the ERP could still be large.

Back to the isotropic antenna. Suppose we send P watts into it, to be radiated into space in all directions. Let's then build a large sphere around the antenna, and collect all the power it radiates—we should then get our P watts back. (Don't worry about how we're going to do this—this is only a theoretical exercise anyway.)

Since this is an isotropic antenna, every part of the sphere gets an equal amount of power. If the sphere has a radius of R meters (the common unit of measurement for this calculation), its surface area is $4\pi R^2$ square meters. Splitting the P watts into $4\pi R^2$ little pieces, each one square meter in size, tells us that the power hitting each and every square meter of the sphere's surface is

$$\frac{P}{4\pi R^2} \text{ watts per square meter.}$$

This number is called the power density at that distance from the antenna. More generally, since an isotropic antenna getting P watts also has an ERP of P watts, we would write this as

$$\text{power density} = \frac{\text{ERP}}{4\pi R^2} \text{ watts per meter}^2$$

"*This antenna is impossible to build, but useful to imagine.*"

Let's try an example. The power density of a 10-watt signal being transmitted by an isotropic antenna (which has an ERP of 10 watts), calculated 1,000 meters away (about 2/3 of a mile), is

$$\text{power density} = \frac{\text{ERP}}{4\pi R^2} = \frac{10 \text{ watts}}{12{,}566{,}360 \text{ m}^2} = 7.96 \times 10^{-7}$$

which is about 0.796 microwatts per square meter.

Let's now switch to a dipole, still assuming little or no loss in the antenna itself. The same 10 watts of power is now being concentrated broadside to the dipole, with little or no power coming off the ends of it. A receiver broadside to the dipole will now get more of a signal than it got with the isotropic antenna.

Broadside to the antenna, a dipole transmits 1.64 times more power than the isotropic antenna. The dipole therefore has a gain of 1.64 over an isotropic antenna, and the ERP is now 16.4 watts. Translated into decibels, we get

$$10 \log \frac{1.64}{1} = 10 \times 0.214 = 2.14 \text{ dB},$$

so the half-wave dipole has a gain of 2.14 dB over an isotropic antenna. To remind us that the comparison is with an isotropic antenna, we write that as 2.14 dBi (i for isotropic).

Obviously, then, an antenna with high gain has to be very directional, since we never get something for nothing—what looks like gain is just the antenna aiming most of the radiated power in some preferred direction, at the expense of other directions.

Let's continue with our example. Suppose our 10-watt signal were radiated with a test antenna having a gain of 3 dB over a dipole; we say that its gain is 3 dBd (d for dipole). If the antenna has gain, then it is directional and so we must aim it toward the receiver; hence we must talk about the gain in its major lobe.

So we might then ask—what would be the power density 1,000 meters away (in the major lobe, obviously)? We already know the power density for an isotropic antenna, so we need to convert dBd to dBi. If our test antenna has a gain of 3 dBd (3 dB over a dipole), and the dipole itself has a gain of 2.14 dBi (2.14 dB over an isotropic), the test antenna has a gain of 5.14 dBi (you add the two dB ratings).

Using the standard formula for converting power gain into dB, we work it backwards to get a power gain of about 3.27:

$$5.14 \text{ dB} = 10 \log \frac{P_{test}}{P_{isotropic}}$$

$$0.514 = \log \frac{P_{test}}{P_{isotropic}}$$

$$\frac{P_{test}}{P_{isotropic}} = 10^{0.514} = 3.27.$$

In other words, the power radiated in the desired direction (the major lobe) of the antenna will be 3.27 times that produced by an isotropic radiator, and so will the power density. (And our ERP is now up to 32.7 watts.)

In our example, the power density would then be

$$3.27 \times 7.96 \times 10^{-7} = 2.60 \text{ microwatts/meter}^2.$$

An easier way to get to this same number is to use the ERP in the numerator of the power density formula, like this:

$$\text{power density} = \frac{\text{ERP}}{4\pi R^2} = \frac{3.27 \times 10 \text{ watts}}{12{,}566{,}360 \text{ m}^2} = 2.60\ \mu\text{w/m}^2.$$

Signal strength

The above calculation gives us the power density a certain distance from the transmitting antenna. However, there are commercial signal strength meters which measure the strength of a signal not as a power density, but in units of volts per meter, and it would be useful to be able to convert from one to the other.

Just as we normally calculate power as

$$\text{Power} = \frac{V^2}{\text{R}},$$

so we can calculate the power density as

$$\text{Power density} = \frac{\text{field strength}^2}{R}.$$

But what is R? R is the resistance that the signal goes through in space. Say that again?

This is another concept that requires some more advanced physics. Let's just say that free space (really vacuum, but air is similar enough) has a *characteristic wave impedance* which, for all intents and purposes, is like the resistance R in an electric circuit; its value is 377 ohms.

In this equation, the power density is measured in watts per square meter, while the field strength is measured in volts per meter. To go from a power density to field strength, we have to rearrange the equation to:

$$\text{Field strength} = \sqrt{\text{Power density} \times 377 \text{ ohms}}.$$

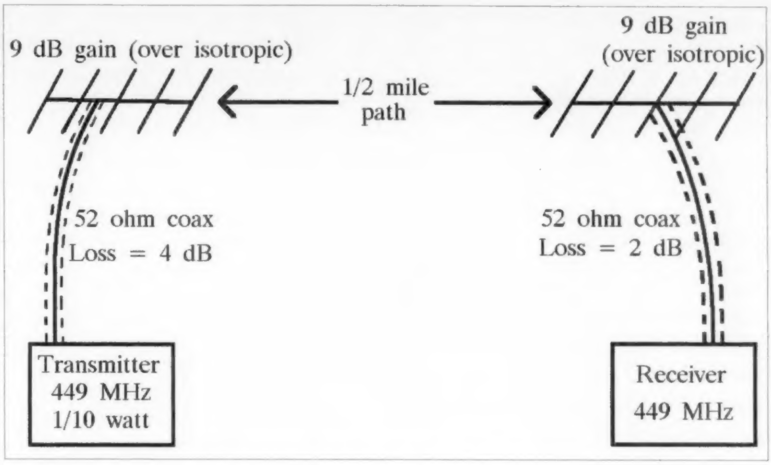


***Fig. 4.** A practical example from ham radio.*

In our example, for instance, we had a power density of 2.60 microwatts per meter². The field strength is therefore

$$\text{Field strength} = \sqrt{.00000260 \text{ watts/m}^2 \times 377 \text{ ohms}}$$

$$= \sqrt{0.00098}$$

$$= 0.031 \text{ volts/meter.}$$

Like some other concepts in antenna work, field strength is somewhat theoretical. It is based on the idea that, if you could somehow stick two voltmeter probes into the air, exactly one meter apart, the meter would measure a voltage of (in this case) 0.031 volts. This is not really possible, of course; actual field strength meters measure the field strength by measuring the output from a calibrated antenna.

Field strength calculations can be useful if you ever get your hands on a calibrated field strength meter, but otherwise are not very useful.

Capture area

As you remember, power density is the amount of power that hits a one-square-meter area at some distance from the transmitter antenna. Let's now place an antenna at that point, and make the antenna exactly one square meter in size. If the antenna can capture all the power hitting it, it will receive the same amount of power. For example, if the power density was 2.60 microwatts per square meter, as in our previous example, a one-square-meter antenna would receive 2.60 microwatts of power. If that antenna was two square meters in area, then it would receive twice as much power, etc.

The catch is that the actual physical area of an antenna doesn't always match exactly the amount of power it captures. Some antennas simply don't capture enough of the signal hitting them, while others capture more signal than their size would indicate—they seem to "reach out" into space around them to capture some signal that would otherwise pass on by. So, rather than talk about their physical area, we consider the effective or working area.

The effective area of the antenna is called its capture area. Once we know the capture area, we can compute how much signal the antenna actually receives from the formula

$$\text{received power} = \text{power density} \times \text{capture area.}$$

The greater the capture area of a receiving antenna, the greater the amount of power it picks up out of the air and sends to a receiver.

As with so many other antenna concepts, the idea of a capture area is purely theoretical. For instance, if it really did what it sounds like it does, namely capture all the power existing in a certain area of space, then a second antenna placed behind the first antenna would pick up no signal at all, and we know that is not true. Similarly, putting a reflector behind a dipole would do nothing because there would be no signal there to reflect, whereas we know that reflectors are commonly used in beam antennas. Still, capture area is a useful concept because it allows us to calculate other antenna parameters. Specifically, it lets us know how much RF signal a given antenna will pick up and deliver to the receiver.

Measuring the capture area, however, is difficult, so we usually work backwards. Instead of estimating capture area and using it to calculate the gain, we measure the gain and use it to calculate the capture area. The gain of an antenna can be measured by comparing it with that of an antenna with a known gain (such as a half-wave dipole). Once we have that, we calculate the capture area from the following equation:

$$\text{capture area} = \frac{\text{Gain x wavelength}^2}{4\pi}$$

where Gain is the gain compared with an isotropic antenna (expressed as a number, not as dBi), and the wavelength is simply the wavelength of the signal which the antenna is trying to pick up.

Let's justify the equation. It's easy to see why the Gain term is in it—if you double the gain of an antenna, that means it picks up twice the signal, which means that it has twice the capture area.

But why the wavelength^2 term, and why is it squared? Let's consider an example. Let's assume that we have a 3 dBi antenna of, say, 2 by 3 feet. Let's now build an identical type of antenna, but for half the frequency. This new antenna will also have 3 dBi gain, since it is the same type of antenna. Yet every dimension of the new antenna has to be twice as large (because the wavelength is twice as large), and so it has a capture area four times as large. So, although the gain has stayed the same, the wavelength has doubled and the capture area has gone up by a factor of 4. So the capture area is proportional to the square of the wavelength.

Practical example

Fig. 4 shows a typical problem from amateur radio. It shows a 0.1 watt transmitter on 449 MHz, feeding a 9-dB-gain beam through a coax which has 4 dB loss. At the receiver, 1/2 mile away, a similar antenna feeds a receiver through a 52-ohm coax having a loss of 2 dB. Under these conditions, how much signal will the receiver get?

Our calculations go like this:

1) Transmitter power is 100 milliwatts into the coax.

2) The antenna has 9 dB gain, but there is 4 dB loss in the coax cable feeding it, so the total power gain is only 5 dB (in the desired direction!). A 5 dB power gain is a power ratio of 3.16, so the power actually radiated toward the receiver is the same as an isotropic antenna would radiate if it was fed with

3.16 x 100 = 316 milliwatts.

In other words, the ERP is 316 mw or 0.316 watt.

3) A half mile is 1609/2 meters, or 805 meters. The power density at that distance is thus

$$\frac{ERP}{4\pi r^2} = \frac{0.316\ watt}{4 \text{ x } 3.14159 \text{ x } (805)^2} =$$
$$0.0388 \text{ microwatts/meter}^2.$$

4) 9 dB antenna gain on the receiver is a power ratio of 8. (Here's a shortcut to figure that out: 9 dB is 3 dB + 3 dB + 3 dB. Since each 3 dB power gain doubles the power, the power increase is 2 x 2 x 2, or 8.)

The wavelength at 449 MHz is

$$\frac{3 \text{ x } 10^8 \text{ meters/sec}}{449 \text{ x } 10^6 \text{ cycles/sec}} =$$
$$0.668 \text{ meters/cycle.}$$

With a 0.668 meter wavelength and a gain of 8, the receive antenna's capture area is

$$\frac{\text{Gain x wavelength}^2}{4\pi} =$$
$$\frac{8 \text{ x } (0.668 \text{ m})^2}{4 \text{ x } 3.14159} = 0.284 \text{ m}^2$$

and so the received power at the receiver's antenna is

received power = power density x capture area

$= (0.0388\ \mu\text{w/m}^2) \text{ x } 0.284 \text{ m}^2$

= 0.011 microwatts.

5) Another 2 dB is lost in the receive coax line; we translate that to a ratio of 1.59 using the equation

$$2 \text{ dB} = 10 \log \frac{P_2}{P_1}$$

so the power arriving at the receiver is only

$$\frac{0.011 \text{ microwatts}}{1.59} =$$
$$0.0069 \text{ microwatts.}$$

6) Since $P = V^2/R$, we can find the actual voltage at the 52-ohm receiver input:

$V^2 = P \text{ x } R$

$V = \sqrt{P \text{ x } R}$

$= \sqrt{6.9 \text{ x } 10^{-9} \text{ watts x 52 ohms}}$

$= 5.99 \text{ x } 10^{-4} = 600$ microvolts.

"Figures lie, and liars figure"

Time to tell the truth. The above numbers are all nice and exact—but in practice, things never quite work out like that. There are a number of other factors which don't show up in the math, such as

- What is between the transmitter and receiver antennas?
- Do they have a clear line of sight between each other, or are there obstructions? The above math assumes a line of sight.
- What about the curvature of the Earth—if the antennas are low enough, the Earth may obstruct the path between them.
- Are there any reflections from other objects? Nearby buildings or hills can provide reflections, but so can the earth below! Earth reflections are less likely with vertical polarization, but they can still occur. And reflections can either add to the signal, or cancel part of it; either way, the actual signal strength at the receive antenna can be drastically different.
- How about the coax, antennas, and connections—are they in good shape, or are there additional losses due to old age, moisture, rust, or other factors?
- How well are the antennas aimed?

- Is the polarization of both transmitter and receiver antennas the same?
- And yes… did the antenna manufacturer tell the truth in specifying 9 dB gain?

Since there is so much variability in these factors, it is usually a good idea to assume that the results could be off by a factor of 10 or more. In other words, a real-life system had better provide ten times more power than the calculations indicate is needed. Still, such calculations do give you a rough idea of the *minimum* reasonable power that might do the job.

Path loss

In the above example, we started with a transmitter output of 100 milliwatts and wound up with only 0.0069 microwatts at the receiver. This is a total loss of

$$\text{Loss } in\ dB = 10 \log \frac{0.0069 \text{ microwatts}}{100 \text{ milliwatts}}$$

$$= 10 \log \frac{6.9 \times 10^{-9} \text{ watts}}{1 \times 10^{-1} \text{ watts}}$$

$$= 10 \log (6.9 \times 10^{-8}) = -71.6 \text{ dB}.$$

Let's see what the signal had to go through on its way from the transmitter to the receiver: a cable at the transmitter; a transmit antenna; half a mile of air; a receive antenna; and some cable at the receiver. Let's then add up the losses in each of these:

Cable at the transmitter	-4 dB
Transmitter antenna	+9 dB
1/2 mile of air	-X dB
Receive antenna	+9 dB
Cable at the receiver	-2 dB
TOTAL	-4 + 9 - X + 9 - 2 = +12 - X dB

But we already know that the total loss is 71.6 dB, so

$$+ 12 - X \text{ dB} = 71.6 \text{ dB}$$

$$X = 83.6 \text{ dB}.$$

In the above example, the antennas actually contributed an 18 dB gain (9 dB for each antenna), while the cable loss added up to 6 dB (4 dB at the transmitter, 2 dB at the receiver). This adds up to a total gain of 18 - 6 = 12 dB. In other words, we had an effective gain of 12 dB in the antenna systems, and still lost 71.6 dB in the transmission; this means that the loss in the 1/2-mile path was actually 71.6 + 12 = 83.6 dB. This is called the path loss.

"Did the antenna manufacturer tell the truth?"

The path loss is actually dependent only on the distance and the frequency. It is calculated by assuming that isotropic antennas are used at both the transmitter and receiver, and there are no other losses in the coax cables. We then use the foregoing equations to calculate, step by step, the received power in relation to the transmitted power.

Alternatively, we can combine all of the above equations into one big equation which gives the path loss directly in dB:

$$\text{Path loss } in\ dB = 10 \log \frac{(4\pi)^2 \times \text{distance}^2}{\text{wavelength}^2}$$

where both the distance between the transmitter and the receiver, and the wavelength, must be given in meters.

The path loss is useful not only in cases where we want to get a signal from one place to another, but also in cases where we don't. For example, suppose a 2-meter receiver is located 1/5 mile (322 meters) away from someone else's transmitter on a nearby frequency; in other words, the nearby transmitter might interfere with our efforts to receive a weak signal. How much interference will the transmitter cause to the receiver? The path loss is a guide to how much the transmitted signal will be attenuated in the 1/5-mile path:

$$\text{Path loss } in\ dB = 10 \log \frac{157.91 \times (322 \text{ m})^2}{(2 \text{ m})^2} = 66.1\ dB.$$

This means that if both the transmitter and receiver have isotropic antennas and no loss in the coax, the received signal will be 66.1 dB weaker than the transmitted signal. In an actual case, you would have to add in any antenna gains, and then subtract cable or other losses, so the actual signal loss might be smaller once these are taken into account.

Radio Bookshop

Phone 800-274-7373 or 603-924-0058, FAX 603-924-8613, or see order form on page 88 for ordering information.

Wayne's Five Buck Books:

Boilerplate. 45 of Wayne's ham oriented editorials. Great material for club newsletter editors who are always short of interesting items for filler.
Submarine Adventures. Wayne's WWII adventures on the USS Drum SS-228, now on display in Mobile, Alabama.
Wayne's Caribbean Adventures. Scuba diving and hamming all through the Caribbean. 11 islands in 21 days on one trip? You bet, and you can't beat the price either.
Wayne & Sherry's Travel Diaries. Cheapskate traveling to Russia, Europe, and so on. Now, how did Wayne and Sherry fly first class to Munich, drive to Vienna, Krakow, Prague, and back to Munich, staying at excellent hotels and eating up a storm, all for under $1,000?
Cold Fusion Journal – Issue #20. Read the latest scoop on cold fusion in this whopping 92-page sample issue. Cold fusion dead? No way!
One-Hour CW Course. How anyone can pass the 5 wpm code test with less than one hour of study. This also explains the simplest system for learning the code at 13- and 20-per ever discovered. Or, do it the old fashioned (ARRL) hard way and suffer. Your choice.
Other, Slightly More Expensive Stuff:
Pure Silver Wire for making those miracle silver colloids. Two 3" lengths of #10 99.999 pure silver wire $15. Should last for years.
Bioelectrifier Handbook. Background, circuits, uses, etc. $10.

WANTED

Fun, easy to build projects for publication in *73*. For more info write to: Joyce Sawtelle, *73 Amateur Radio Today*, 70 Route 202 North, Peterborough NH 03458.

Quartz Crystals

An overview of these frequency controllers.

Hugh Wells W6WTU
1411 18th Street
Manhattan Beach CA 90266

Hams have been fascinated by quartz crystals since their first use. They and other people involved in radio have used quartz crystals for many years, perhaps without understanding the material.

Quartz has been recognized for at least 7,000 years and was originally used as jewelry. Around 1880 Professor Pierre Curie discovered the piezoelectric effect of quartz. This effect is the one used in radio crystals; it refers to the vibration of the crystal in the presence of an electric field.

Dr. Walter G. Cady took out a patent in 1920 on quartz as a means of controlling and measuring radio frequencies. At the time, most transmitters were self-excited and lacked frequency stability. With few stations and lots of frequency spectrum to work with, the instability was of little concern.

However, today it is another matter. Frequency stability and control are extremely important with the crowded bands. Quartz crystals have provided the means of controlling frequencies easily. Not too long ago, a radio required a crystal for every discrete frequency; today only one or two crystals are required in a frequency synthesizer to provide the stability required for all of the frequencies generated by the synthesizer.

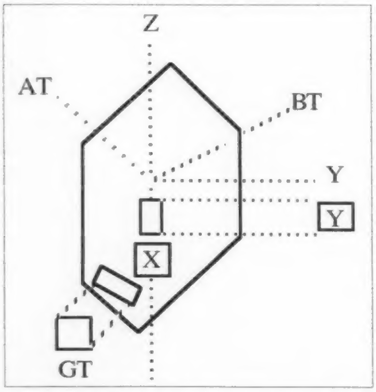


Fig. 1. Some of the different cuts available from a quartz bar.

Synthetic quartz

At one time, all of the quartz used for radio crystals was natural quartz material. Most of the world's supply of radio grade quartz was obtained from South America, and specifically from Brazil. But with a diminishing supply of high grade radio quartz and with increased demand, the development of synthetic quartz increased rapidly. Synthetic quartz, also called "cultured" quartz, was developed in 1845, even before piezoelectric effects were known.

Synthetic quartz is grown using hydrothermal techniques. Polycrystalline quartz is dissolved in a hot alkaline solution and then re-crystallized. Fragments of natural quartz are used as seed crystals to start the process by providing the model for crystalline structure growth from the solution.

The difference between natural and synthetic quartz is minimal as far as users are concerned, and usually involves imperfections in the crystalline structure of the synthetic material. These imperfections are detected and discarded at the time of material grading, before making usable radio crystals.

It is interesting to note that the structure of synthetic quartz is considerably more uniform than natural quartz. The purity of synthetic quartz has provided a higher yield of radio grade quartz than was ever obtained from natural quartz. The final result is a lower cost to the user.

When a crystal is ordered from the factory, the user seldom knows much more than whether the crystal is a fundamental or overtone type. **Fig. 1** shows some of the different cuts from the quartz bar. Each of the cuts has a name, such as AT, BT, CT, GT, etc. The various cuts exhibit different characteristics, which crystal manufacturers take advantage of to produce a crystal suitable for each application.

The crystal bar has three main axes, X, Y and Z. These axes are really directions and are related to the physical property of the material (**Fig. 2**). The Z axis is the easiest to identify because it runs the long way from end to end of the bar. The X axis runs in a direction through the corners of the bar and 90 degrees from the Z axis. The Y axis is a direction through the flat side of the bar and 90 degrees from both the X and Z axes. All of the specific crystal cuts are oriented from these axes.

Quartz use applications

The first usable cuts made from a quartz bar were from the X axis. Later the Y cut was introduced because it was easier to excite in an oscillator circuit than an X cut. However, the Y cut stability tended to be poor and it could change frequency abruptly. During World War II, crystal cuts such as AT, BT and CT were developed to reduce the effects of

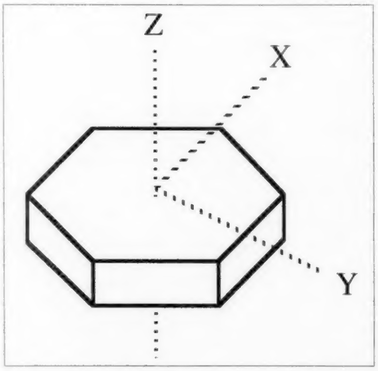


Fig. 2. Quartz bar slice, showing the X, Y and Z axes.

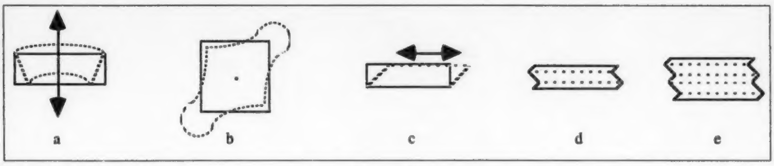


Fig. 3. Relative frequency range and mechanical movement: *(a) Fundamental flexure mode 10 kHz - 100 kHz. (b) Fundamental face shear 180 kHz - 1 MHz. (c) Fundamental thickness shear 1 - 20 MHz. (d) 3rd overtone 5 - 61 MHz. (e) 5th overtone 50 - 125 MHz.*

temperature and abrupt shifts in frequency. The AT cut is now the most popular for radio applications, but BT, CT and GT cuts are used extensively to meet stability and overtone requirements as a function of temperature and excitation.

A quartz crystal is cut with a saw running in a slurry containing diamond dust. Originally only one saw blade was used, allowing one crystal blank to be cut at a time. Now, a gang saw is used so that many crystal blanks can be cut in a single pass. Once cut, each blank is graded and finished to customer requirements.

Quartz responds to the effects of an electrical field by creating a mechanical movement (piezoelectric). The relative frequency range and mechanical movement are shown in **Fig. 3**. Fundamental low frequency crystals with their large mass vibrate to create the appearance of a pillow. At higher fundamental frequencies, the crystal appears to squirm (rotate about its center line). During overtone operation, the crystal appears to vibrate in shear. The number of shear layers produced are odd in number; that three layers produce the third overtone (third harmonic of the fundamental). Five layers would produce the fifth overtone, etc. The overtone frequency produced, although not controlled by the fundamental mode, is a near multiple of the fundamental (about 25 kHz per overtone higher). When being produced, the crystal is processed for the end use frequency and overtone mode of operation with no concern as to what fundamental properties it might have.

In operation, the quartz crystal functions just like a coil and capacitor in a resonant circuit and can function as either a series or parallel resonant circuit. Fig. **4** shows the equivalent circuit of a crystal which can be used to define the operation of the crystal exactly. The inductance L represents the mass of the crystal, the capacitance C1 represents the resilience, and the resistance R represents the frictional losses. Capacitor C2 represents the crystal electrodes across the crystal as a dielectric. Capacitor C3 represents the series capacitance of the crystal and the electrodes. Depending upon the mode, the circuit can represent either a series or parallel resonant circuit. When the combined reactance of C1 and L are inductive and equal to the reactance of C2, the crystal will operate in the anti-resonant mode (parallel resonance). When the reactance value of L equals C1, the crystal will operate in the resonant mode (series resonance).

When operating a crystal in an oscillator circuit, capacitor C2 may be paralleled with a trimmer capacitor to cause a small change in the crystal's anti-resonant frequency. If the crystal is operating in the overtone mode, either series inductance or capacitance will cause a crystal frequency shift. External frequency adjustment must be used sparingly as crystal stability will be affected. **Fig. 5** shows the reactance curve of a quartz crystal and the small difference between the resonant and anti-resonant points. Notice that the resonant (series) frequency is slightly lower than anti-resonance (parallel). In the resonant mode, the crystal exhibits a low impedance across its terminals, and a high impedance across its terminals when in anti-resonance.

One of the biggest user concerns about quartz crystals is the aging factor. In other words, how much will the crystal drift after it is placed in operation? Quartz crystal aging applies to the cumulative change in frequency, which results in a permanent change in the operating frequency. The rate of change is the fastest during the first 45 days of operation. Many interrelated factors are involved in aging, some of the most common being internal contamination, excessive drive, surface change of the crystal, various thermal effects, wire

HF SSB RECEIVER

R-1051B RECEIVER, covers 2-29.9999Mhz AM-CW-LSB-USB-ISB using six decade band tuning + vernier; 500 Khz IF. Meters and controls for LSB & USB Levels; also BFO, 600 ohm audio & 50 ohm input impedance. Solid-state except for 3 tubes. Requires 115 VAC 50-400 Hz; 7x17.4x18.9, 85 lbs sh.

USED-CHECKED .... ~~$650~~ **$350**

MANUAL for R-1051B, partial repro **$45**

SHOCKMOUNT, new **$22**

R-1051G, later IC-version of above,

CHECKED .... ~~$795~~ **$625**

Prices F.O.B. Lima, O.• VISA, MASTERCARD Accepted.
Allow for Shipping • Write for latest Catalog
Address Dept. 73 • Phone 419/227-6573 • Fax 419/227-1313

FAIR RADIO SALES
1016 E. EUREKA • Box 1105 • LIMA, OHIO • 45802

CIRCLE 75 ON READER SERVICE CARD

Walking-Stick Beam?

Hold it in your hand—it's a walking stick made of aluminum with rubber ends. But inside are all the elements of a 4 element yagi that goes together in 2 minutes. Ready for the T-Hunt. Ready to get your signal out of a hole into the repeater. No little bits to drop and get lost. Everything fits clean and tight and tough. 2meters $79, 70 cm $49. Weighs only 1 lb. Add $6 Shipping & Handling. Info $1.

AntennasWest
Box 50062-S Provo UT 84605

Order HotLine
801 373 8425

CIRCLE 324 ON READER SERVICE CARD

EVERY ISSUE OF
73 Amateur Radio Today on Microfiche!

The entire run of 73 from October 1960 through last year is available.

You can have access to the treasures of 73 without several hundred pounds of bulky back issues. Our 24x fiche have 98 pages each and will fit in a card file on your desk.

We offer a battery operated hand held viewer for $75, and a desk model for $260. Libraries have these readers.

The collection of over 600 microfiche, is available as an entire set, (no partial sets) for **$285** plus $5 shipping (USA). Annual updates available for $10.

Satisfaction guaranteed or money back!

BUCKMASTER
6196 Jefferson Highway
Mineral, Virginia 23117
540:894-5777·800:282-5628
Internet: info@buck.com
Fax 540:894-9141

CIRCLE 168 ON READER SERVICE CARD

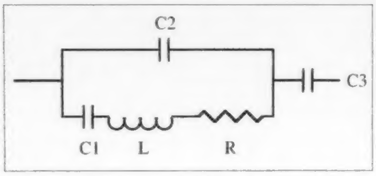


***Fig. 4**. Equivalent circuit of a crystal which can be used to exactly define the operation of the crystal.*

fatigue and functional wear. Proper circuit design incorporating low operating ambients, minimum drive level and static pre-aging will greatly reduce all but the most severe aging problems.

Vibration

Quartz crystals vibrate when operating due to their piezoelectric characteristic, although the amount of vibration is quite small in relation to the physical size of the crystal. Even though small, the vibration causes stresses in the structure, which generates heat. If not kept within limit, the internal stress can cause permanent damage through rapid aging and/or fracturing. Excessive oscillator drive can cause severe stresses to occur. Once fractured, of course, the crystal is no longer of any value.

Vibration of the crystal also creates heat which can adversely affect the operation and stability of the crystal. Frequency drift is the usual symptom of heat. To keep the crystal temperature down, the oscillator drive level must be kept as low as possible, usually below 1 mW for crystals used as a standard frequency reference. Overtone crystals may require 1-2 mW of drive, while fundamental crystals operating below 10 MHz may require up to 10 mW. The drive level should be cut by 50% of the above indicated values when the crystal is used in an oven.

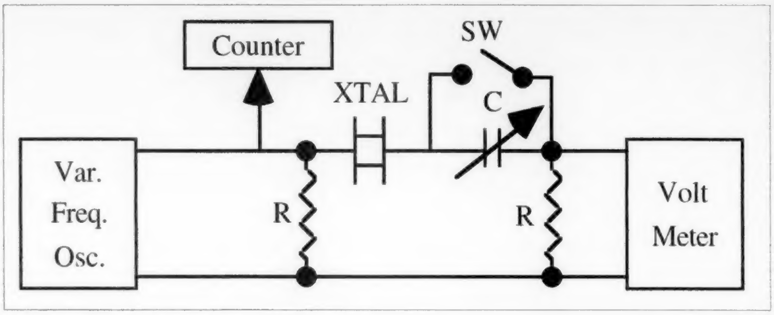


***Fig. 6**. Crystal test circuit.*

The amount of crystal drive is usually related to the amount of crystal activity required, and in this case refers to the ability of the crystal to vibrate. Some crystal test oscillators have a meter in the circuit to indicate the relative strength of activity. The amount of crystal activity indicated by a meter is vague, but nevertheless provides a reference.

Many things control the amount of activity that a crystal will exhibit. For the older style pressure-mounted crystals, dirt and mounting conditions were a major factor. Modern hermetically sealed crystals are not affected by the environment. Therefore, manufacturing techniques, the Q factor of the cut and frequency will affect the drive level requirement. Of importance, though, is the ability of the crystal to start easily in the circuit and maintain a given frequency. The amount of drive applied should be just high enough to create reliable oscillator stability and operation. A large drive value could cause fracturing or excessive aging.

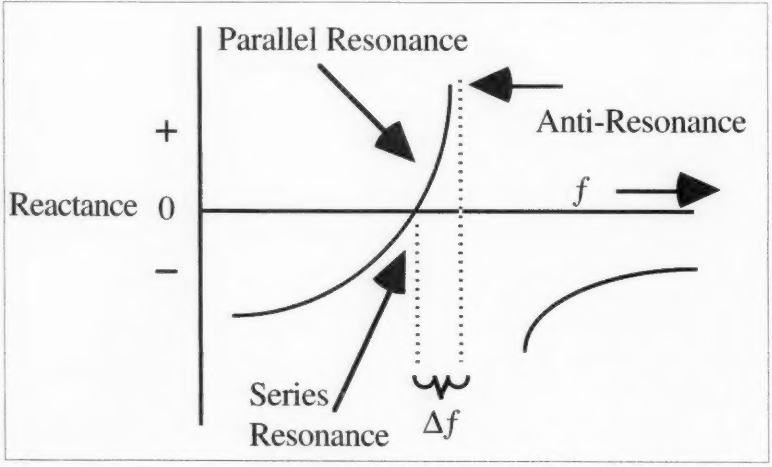


***Fig. 5**. The reactance curve of a quartz crystal.*

Testing a crystal

Parameters of a quartz crystal can be tested by placing the crystal into a passive network, as shown in **Fig. 6**. A variable frequency oscillator is used to drive the crystal, which is mounted in a pi network of equal value non-inductive resistors. An RF voltmeter is placed on the output to measure the signal transferred through the network. For phase angle measurements, a vector voltmeter may be placed in parallel with the crystal. Being passive, the crystal will respond to the drive frequency at both its resonant and anti-resonant frequencies. Actually, the crystal operates/responds as a filter. Using this network, it is possible to measure the phase angle of the voltage across the crystal (zero degrees equals resonance, 180 degrees equals anti-resonance), determine the crystal impedance and equivalent resistance and determine the crystal's load capacitance. The load capacitance can be determined by placing a capacitor in series with the crystal while it is connected in the network and then measuring the voltage vector across it. As an example, the frequency of the oscillator is set to the anti-resonance frequency of the crystal (180 degrees of phase shift across the crystal), then the value of the series capacitor is adjusted until a phase angle of 180 degrees is obtained across it. The total phase angle between the oscillator and network output is 360 degrees. The value of the series capacitor is equivalent to the load capacitance value (typical values range from 20 to 32 pF).

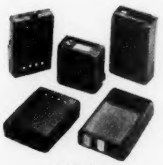
Not all of the parameters are needed to use the crystal in an oscillator; but the more that are known, the simpler it is to design the oscillator.

ADVERTISERS' INDEX

R.S.#		page
•	A&A Engineering	41
351	Absolute Value Systems	17
68	Advanced Battery Systems, Inc.	49
•	All Electronics Corporation	19
•	AlphaLab, Inc.	39
57	Antennas West	1
116	Antennas West	15
132	Antennas West	17
336	Antennas West	20
332	Antennas West	28
89	Antennas West	30
380	Antennas West	30
5	Antennas West	33
135	Antennas West	41
324	Antennas West	71
16	Astron Corporation	2
41	Barry Electronics Corp	17
42	Bilal Company	25
163	Bisme Computers	63
168	Buckmaster Publishing	71
56	Buckmaster Publishing	81
224	Burghardt Amateur Center	33
184	C & S Sales, Inc.	47
186	Coaxial Dynamics	15
99	Communication Concepts	41
10	Communications Specialists, Inc.	47
276	Computer Aided Technology	37
189	Davis RF Company	31
•	Dayton Hamvention	29
114	E. H. Yost	28
•	Electronics Book Club	13
8	Elktronics	15
142	EMAC, Inc.	24
75	Fair Radio Sales	71
•	Gap Antennas	CV3
193	GGTE	15
•	Hamtronics, Inc.	CV2
258	Hately Antenna Technology	23
•	Index Laboratories	55
174	Index Publishing Group	33
77	Interflex Systems	43
42	Isotron	25
242	Jan Crystals	25
341	Kepro Circuit Systems	39
150	Littlite/CAE, Inc.	16
86	MFJ Enterprises	11
•	Michigan Radio	7
160	Micro Computer Concepts, Inc.	41
193	Morse Tutor Gold	15
248	Motron Electronics	24
114	Mr. Nicd	28
54	NCG	81
226	Pacific–Sierra Research	57
•	P.C. Electronics	59
•	Peet Bros.	28
68	Periphex	49
257	Quorum Communications	9
•	Radio Book Shop	52
•	Radio Book Shop	63
•	Radio Book Shop	69
•	Radio Book Shop	88
68	Raibeam Antennas	49
34	Ramsey Electronics	5
254	Ross Distributing	23
241	Seagon Company	23
167	Sescom, Inc.	43
•	Sirio Antenna	CV4
•	Smiley Antennas	77
250	Software Systems Consulting	25
69	Spectrum Electronics	81
141	The Nicad Lady	39
146	The Tech Shack	43
269	Tigertronics	51
22	Tri-Ex Tower Corporation	61
•	Universal Radio	31
224	U.S. Digital Ltd.	33
259	Versatel Communications	33
104	Vis Study Guides, Inc.	30
191	W & W Associates	73
350	Warren Gregoire & Assoc.	31
245	Wavemach Communications	17

When you buy products from these advertisers, please tell them that you saw their ads in 73.

Subscribe to 73 right now...call 800-274-7373 (9-5 Monday-Friday EST).



BATTERIES

BUY DIRECT FROM US, THE MANUFACTURER!

YAESU

FNB-2	10.8v @	600 MAH
FNB-4	12v @	750 MAH
FNB-4A	12v @	1000 MAH
* FNB-10(S)	7.2v @	1200 MAH
FNB-12(S)	12v @	600 MAH
FNB-17	7.2V @	600 MAH
FNB-25	7.2v @	600 MAH
FNB-26	7.2v @	1200 MAH
**FNB-26(S)	7.2v @	1500 MAH
FNB-27	12v @	600 MAH
**FNB-27(S)	12v @	800 MAH
**1/4" longer than FNB-27		
FNB-31	4.8v @	600 MAH
FNB-33(S)	4.8v @	1500 MAH
FNB-35(S)	7.2v @	600 MAH
* FNB-35(S)(S)	7.2v @	1500 MAH
FNB-38	9.6v @	600 MAH

*1 1/3" longer than FNB-38 case

BATTERY ELIMINATORS AVAILABLE

SPECIAL

FOR THE MONTH OF APRIL

10% OFF

on ALL

STANDARD

Replacement Batteries

Look for May's Special of the Month

MONTHLY DISCOUNTS APPLICABLE TO END-USERS ONLY

Powerpac+®

6 V for Camcorders & 12 V for 2-way

Prices and specifications subject to change without notice.

NYS residents add 8 1/2% sales tax. Add $4.00 for postage and handling

W & W ASSOCIATES

800 South Broadway, Hicksville, NY 11801

WORLD WIDE DISTRIBUTORSHIPS AVAILABLE. PLEASE INQUIRE.

MADE IN THE U.S.A.

SEND FOR FREE CATALOG AND PRICE LIST

In U.S.A. and Canada Call Toll Free:(800) 221-0732 • In NY State Call:(516) 942-0011 • Fax:(516) 942-1944

CIRCLE 191 ON READER SERVICE CARD

10 Meters Lives!

Don't let the sunspot cycle fool you.

Phil Salas AD5X
1517 Creekside Drive
Richardson TX 75081

Have you tried 10 meters lately? I know, I know. We're at or near the bottom of the sunspot cycle and 10 meters is useless—or *is* it?

I've been finding this band opening up frequently. It often opens from the late morning through the afternoon. I've also found it open occasionally to as late as 10:00—at night! One recent Saturday evening I got on 10 meters at 8:00 p.m. and worked K2YJL/mobile in Kentucky running a Uniden 2510, N0KXL in Kansas running a Uniden 2510, and KF4BGR in Florida running an Emperor TS-5010. K2YJL told me he has confirmed 170 countries over the past two or three years operating mobile with his Uniden 2510 and Hamstick™ antenna! I suspect that 10 meters has *always* had openings, even during lows in the sunspot cycle. Most rigs nowadays have scanning capability. Go ahead and put your radio on scan so you'll find out when the band opens. Incidentally, the belief that 10 meters is dead has resulted in some great deals on the above-mentioned rigs. To give you a personal example, I recently traded an unused microphone for a mint condition HTX-100!

OK, you've scored that 10-meter rig from a less-than-savvy, but happy, previous owner (he thinks *you* got the short end of the deal). Now you need an antenna or two to get going.

For 10-meter base station operation, I recommend a high horizontal antenna. I've found that a high horizontal antenna usually outperforms a ground-mounted vertical or ground plane antenna by several S-units.

Recycle that, good buddy!

Look for used CB antennas at hamfests. A dipole made from two slightly shortened CB whips back-to-back at 20-25 feet up in the air will do a great job. For the dipole center, use a PVC "T" attached to the top of a PVC or aluminum mast attached to your chimney with a cheap hardware-store chimney mount.

To attach the CB whips to the PVC "T," use PVC reducers and 1/8-NPT brass adapters as shown in **Fig. 1** (all available from your local hardware store). As it turns out, 1/8-NPT is the same as a slightly tapered standard 3/8 x 24 antenna thread. You can chase the 1/8-NPT threads with a 3/8 x 24 tap but this isn't really necessary unless you'll be screwing and unscrewing the elements frequently.

Pick the "T," reducers, and adapters to fit your mast. The 3/4" PVC "T" shown has an inside diameter of one inch, because it must pass over the one-inch outside diameter of 3/4" PVC pipe and so it will take a one-inch OD aluminum mast. The CB whip bases screw directly into the 1/8-NPT thread.

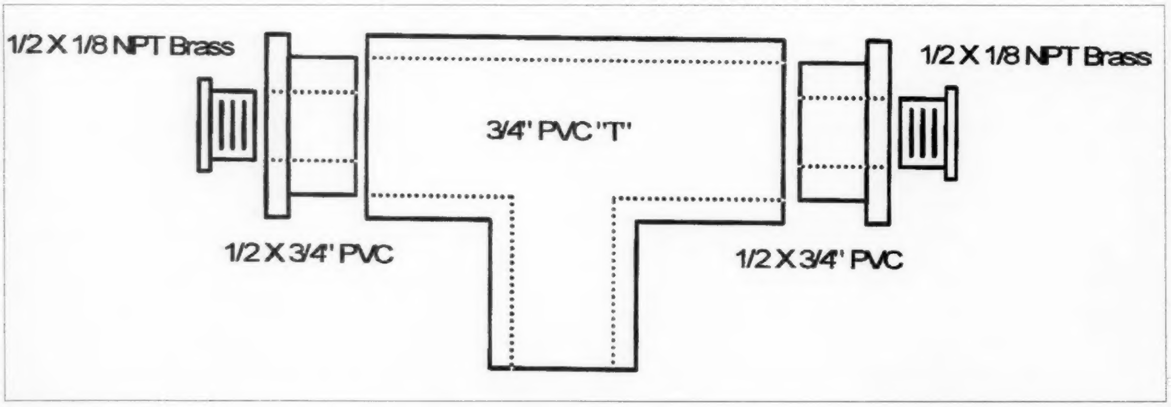


Fig. 1. Dipole center piece.

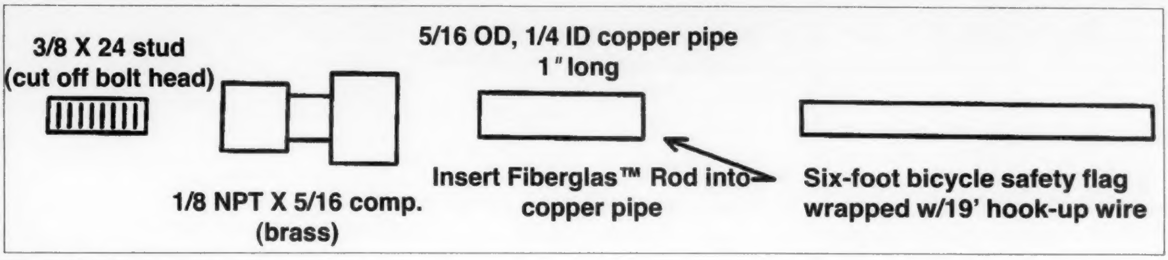

3/8 X 24 stud
(cut off bolt head)
5/16 OD, 1/4 ID copper pipe
1" long
1/8 NPT X 5/16 comp.
(brass)
Insert Fiberglas™ Rod into copper pipe
Six-foot bicycle safety flag wrapped w/19' hook-up wire

Fig. 2. Mobile antenna details.

To attach your coax, drill and tap holes in each of the brass adapters to take a #6 brass screw. Attach a solder lug to each adapter with brass screws (use brass or copper lockwashers). Solder the shield to one solder lug, and the coax center conductor to the other solder lug.

Alternately, you can just drill a small hole in each brass adapter and solder a wire to the hole to use as the connecting point for your coax (solder to the brass adapters *before* they are mounted in the PVC, or you'll have a melted PVC mess on your hands!).

If you're a real purist, you can also add a balun, but that's not really necessary if your coax exits the antenna at right angles and stays that way for a while.

Goin' mobile

When you're shopping for those used CB antennas for your base station dipole, think about a *third* CB whip for your car. Operating mobile will add another exciting dimension to your ham fun. The Uniden, Radio Shack, Lincoln, Emperor, etc., rigs are all small enough to fit easily in all cars. My Uniden 2600 mounts vertically on the transmission hump in my Geo Metro and causes no problems to the passenger (normally the ever-critical spouse). Incidentally, the CB antennas need to be shortened about four to five percent to put them on 10 meters. An MFJ or Autek SWR analyzer will permit you to get everything perfect in an amazingly short time!

Mobile antennas for 10 meters can be made inexpensively by shortening CB antennas as mentioned above—but you can "roll your own" low profile (six feet) 10m mobile antenna for even less!

As you can see in **Fig. 2**, a mobile antenna can be built from a 6-foot Fiberglas™ bicycle safety flag (around $3 at discount stores), 19 feet of #22-24 hookup wire, a one-inch-long piece of 5/16" OD (1/4" ID) copper pipe, a 1/8-NPT x 5/16 compression brass adapter, a 3/8 x 24 bolt, and some 3/8" heat-shrink tubing.

To build this antenna, solder one end of the hookup wire to one end of the one-inch-long copper pipe. Put some epoxy on one end of the Fiberglas rod and slide this end of the rod into the copper pipe. Next, insert the copper pipe into the 5/16" compression fitting and tighten. Screw a 3/8 x 24 stainless-steel bolt into the 1/8-NPT end of the brass adapter and tighten securely (the 1/8-NPT tapered thread makes a nice interference fit). Cut off the head of the 3/8 x 24 bolt and file off the rough edges as necessary so it will screw into a 3/8 x 24 mount. Now, wrap the wire evenly around the whip and hold the end of the wire in place temporarily with masking tape. Mount the antenna on your car and check the resonant frequency with your SWR analyzer.

"Operating 10m mobile will add another exciting dimension to your ham fun!"

If the resonant frequency is too low, you can either remove some wire or compress the turns at the top of the antenna. If the resonant frequency is too high, compress some turns around the center of the antenna. With just a little effort, you can adjust the turns and turn spacing to resonate this antenna right where you want it. Incidentally, the SWR at resonance will probably be around 1.5:1. Since most radios aren't bothered by a 2:1 SWR and the cable loss will be negligible, you really don't need to worry about this "high" SWR. However, if you want a perfect 1:1 SWR match, connect a 25 pF 500 WVDC silver mica capacitor from the base of the antenna to ground. Make sure you make the antenna adjustments with the capacitor in place.

When the antenna resonates where you want it, add a few pieces of heat-shrink tubing along the length of the antenna to hold the wire in place. You now have a flexible, low profile, and low wind resistance 10-meter mobile antenna for less than $7! This same method works for other frequency band antennas, too.

I turned my Uniden 2600 into a dual-band 10- and 12-meter rig by adding the Chipswitch™ to it, so I also needed a 12-meter mobile antenna. The Chipswitch (available from Chipswitch, 4773 Sonoma Hwys, Suite 132, Santa Rosa CA 95409-4269, FAX 707-539-7571 or phone 707-539-0512), permits continuous operation between 24.5 and 30 MHz for Uniden and Lincoln 10-meter rigs. For my 12-meter mobile antenna, I started with 20 feet of wire and was easily able to get the antenna to resonate in-band.

I also built a 15-meter mobile antenna which required 25 feet of wire. For frequencies below 10 meters, the base matching capacitor becomes more important for keeping the SWR reasonable. I needed 50 pF on 15 meters for a 1:1 SWR.

Ten meters is not as dead as many folks think—and it's easy (and inexpensive) to get on the band. I've given you some hints on obtaining inexpensive 10-meter rigs, and information on building inexpensive base and mobile antennas. When the sunspots finally start to appear, you'll have a head start on all the fun. 73

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØOV
PO Box 2508
Fullerton, CA 92633

New ideas never cease

Friendly competition, international goodwill, emergency rescues, self-policing, and wildlife management—what do they have in common? All are important uses for radio direction finding (RDF). Whether your interests in ham radio are technical, social, or public service, RDF can play an important part.

When I talked to *73*'s then-editor Bryan Hastings NS1B in the summer of 1988 about a monthly RDF column, he was interested but skeptical. He asked, "Do you really think there is enough material for a full year of columns?" I nervously assured him that I had a long list of topics.

Next month's "Homing In" will be Number 100. With your help, this department has presented stories of transmitter hunters in action from cities and towns all over the country. There have been reviews of new commercial RDF gear and projects to build at home; also, the first detailed coverage by a major ham magazine of APRS, LoJack™, and Teletrac™ has been on these pages. There was even a turtle-tracking expedition. Despite all this, my list of potential topics is longer than ever. Technical innovations are coming at an increasing rate and T-hunters are always finding new ways to have fun.

"Some hams from China are proposing a new type of ARDF contest they named the Technical Session."

If you are new to *73* and want to see what you have missed in "Homing In," you will find a complete chronological index at my site on the World Wide Web (http://members.aol.com/homingin/). Don't forget the forward slash at the end of the address. If you don't have Web access, send me a self-addressed stamped envelope and I will mail you a copy.

Photo A*. Want outdoor fun for your ham club's picnic, hamfest or Scout troop? Hold an IARU-style foxhunt! A new rules proposal makes it easier than ever.*

T-Hunts—grass roots growth

As it was when the first "Homing In" appeared, mobile hidden transmitter hunting is still the most popular use of RDF by hams in the USA, and it's growing. I regularly hear from clubs that have just begun to sponsor T-hunts. A good example is the Silver Creek Amateur Radio Association (SERA) of Doylestown, Ohio, near the cities of Akron and Canton. According to Jim Korenz N8PXW, SERA holds hunts once a month, except in winter. They start from a shopping center parking lot in Doylestown or Barberton.

"Most of our hunts are not too sophisticated," Jim says. "They run about 20 or 30 miles maximum. Parts of the area are rural but it's still fairly urban. Most of the time, the person with the fox is in a car by the side of the road or in a park."

Simple 2-element quads or yagis are most popular for 2m RDF in N8PXW's area. Jim prefers his home-built Roanoke Doppler with a wideband antenna set of four magnetic-mount whips (see "Homing In" for April and June 1995). Having learned about microcontrollers on the job, he decided to see if they could augment his setup. "I acquired a Motorola GPS board in Dayton and decided to link the two together," he told me. "I increased the clock frequency from 8 kHz to 64 kHz. This gave me 7 bits of angle data. I got the eighth bit from the clock chip. I latched the data with a 74LS374 octal latch and fed it to a Motorola 68705P3 microcontroller by way of the 8-bit data port.

"The processor converts the 256 counts into 360 degrees, puts the number into an ACSII message, and transmits this data via RS-232 to a display processor for the GPS," N8PXW continues. "That display processor is also a home-built 68705P3 unit, which receives the NMEA format messages from the GPS, parses the data, and sends the values to the LCD display. It also receives the Doppler data, adds the GPS-determined heading for the vehicle, and displays the signal bearing relative to true north.

"The GPS processor outputs the latitude, longitude, and bearing as an ACSII message from another RS-232 port. The data is sent only when the vehicle speed is greater than 5 mph and three or more satellites are seen by the GPS. I tried to average the bearing data with the processor, but the eyes seem to do a better job."

As experienced hunters know, the performance of Dopplers versus RDF beams depends on the nature of the hunt. "The Doppler usually works very well," Jim says. "On my first hunt, I arrived about 20 minutes before anyone else, but I placed second because the hunt was scored by mileage, and mine was one mile longer than the winner. The worst experience with the Doppler was when I was within a half mile of the T in a dense forest of large trees. All the indicator did was continuously spin around in circles with no obvious direction."

SERA hams have learned that a prepared group of T-hunters helps to minimize malicious QRM on local repeaters. "Last year we had a jammer who would put out whistles and dead carriers," says N8PXW. "At first he was on maybe once a week, but by Christmas he was on all the time, including midnight and early mornings. So four teams started looking one night. Home stations with beams said he was south of Doylestown, so we took off and ended up in the country with no signal to hunt. Now I know what it feels like to be a private eye—a lot of sitting on lonely roads with people going by saying, 'What are you doing out here? It's 20 degrees!'

"A couple of nights later, the whistler was on pretty solid again," Jim continues. "I could hear him on the input from home, so we went out again. I got out on the freeway past the local airport and the Doppler kicked in, pointing due south. I got three good bearings and then the signal stopped for the night. The readings crossed in the city of Massillon.

"We all went down there the next night. I couldn't detect the signal from the south and east of Massillon, but some of the other guys picked it up from the west and north. We didn't find it. However, one of our young hams got on the repeater next morning saying, 'My dad was out in Massillon, real close to the jammer.' We haven't heard the QRM since."

For the latest SERA hunt schedule, send E-mail to: w8wky@amsat.org. If you are in the area, call on the 147.39 repeater.

ARDF—a new attitude

On-foot radio-orienteering (ARDF) is the fastest growing form of competitive direction finding outside the USA. In many countries of Europe and Asia, it is a school sport with regional, national, and international championships. North America has a long way to go to catch up to the level of ARDF activity in International Amateur Radio Union (IARU) Region 1 (Europe/Africa) and Region 3 (Asia and South Pacific). Nevertheless, this year's spring thaw will bring out ARDF enthusiasts in several cities of North America.

At the ARDF Working Group meeting in Bulgaria last year, a new age category, Veterans, was officially added to European events. In it are men age 56 and older. Seniors (men ages 19 to 40) must find all foxes on the course to win. Contestants in other categories, including Veterans, need to find only four.

With the addition of Veterans, there are now four categories for males and only one for females (see **Table 1**). The four-to-one ratio did not sit well with some delegates. A formal proposal was put forth one month later to have four categories for women as well, with the same age ranges. The proposal, written by OK2BWN and DL5NBZ, would require those in the M20 category (men ages 19 through 40) to find all five foxes. Males and females in all other categories need find only four, except for D56 (women 56 and older) who would have to find only three.

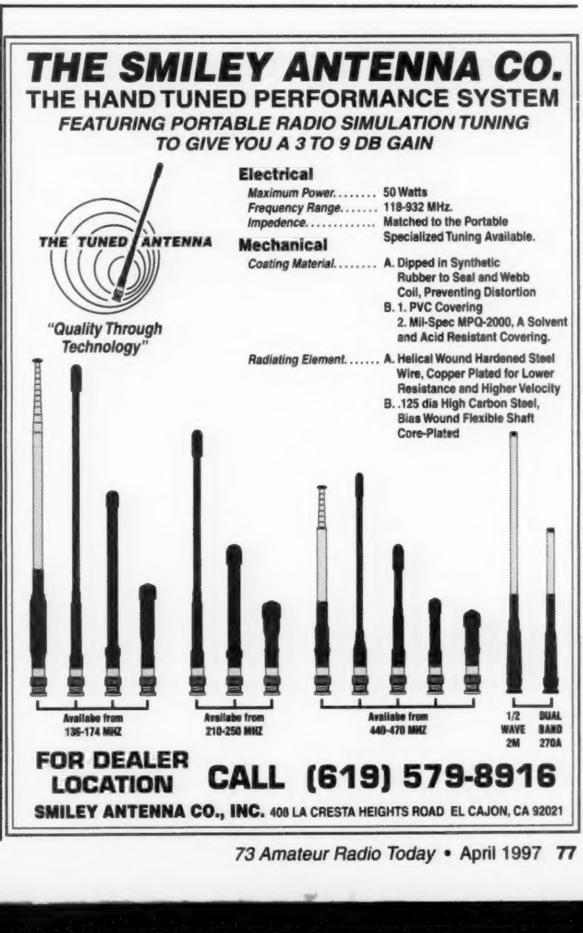
Is the proposal fair or is it discriminatory? That will be debated by the Region 1 ARDF Working Group when it meets in Germany this September. Meanwhile, you can read the complete proposal text at the "Homing In" Web site.

A serious impediment to the growth of stateside ARDF is the mandatory logistics and organizational effort. IARU's official "Rules for Championships in ARDF" is 12 pages of fine print that specifies in great detail how courses must be set up and competitions must be run. Following these rules requires carefully synchronized transmitters, individual timing and starting of competitors, plus other restrictions that make it necessary to have a staff of non-hunters to oversee the event.

2m IARU championships must use AM transmitters and MCW fox signals, which are incompatible with the equipment and skills of most new hams. The courses are large (at least 500 acres), so only true athletes have a chance of winning. With the realization that these rules and restrictions are discouraging many ham hobbyists from trying ARDF, some hams from China are proposing a new type of ARDF contest that they named the Technical Session.

	VHF Class (IARU Rules)	**Technical Session (BA1HAM Proposal)**
Categories	**Juniors** (boys under 18) **Seniors** (men 18 to 40) **Old Timers** (men 41 to 55) **Veterans** (56 and older) **Women** (any age)	**Youngsters** (boys under 14) **Gentlemen** (men 15 to 55) **Old Timers** (56 and older) **Ladies** (any age)
Site	Predominantly wooded	Any kind of field
Total course distance	5 to 10 kilometers	1 to 3 kilometers
Number of foxes	5	8 to 12
Min. fox separation	400 meters	5 meters
Verification method	Distinctive punches at foxes	Unique control numbers
Dummy controls?	No	Yes, 2X to 5X number of foxes
Fox placement	Visible with red/white flags	Concealed, invisible
Mode	2 meter AM	2 meter FM simplex
RF carrier	Keyed and modulated	Modulated
Transmitter power	0.25 to 1.5 watts	100 to 200 milliwatts
Antenna polarization	Horizontal	Vertical
Foxes heard at start	All	At least half
Identification	8-12 WPM CW, MOE, MOI, etc.	Slow CW, single character
Timing	1 minute on, 4 minutes off	3 seconds on, 30 seconds off
Synchronized?	Yes, in numbered sequence	No, slight timing variations
Map	1:20,000 orienteering	Simple with roads and buildings
Start method	Five minute intervals	All together

***Table 1**. Comparison of rules between the traditional IARU two-meter foxhunt and the proposed Technical Session. The total course distance is the minimum path from start to each transmitter and then to the finish.*


THE SMILEY ANTENNA CO.
THE HAND TUNED PERFORMANCE SYSTEM
FEATURING PORTABLE RADIO SIMULATION TUNING TO GIVE YOU A 3 TO 9 DB GAIN

Electrical
Maximum Power........ 50 Watts
Frequency Range....... 118-932 MHz.
Impedence............. Matched to the Portable Specialized Tuning Available.

Mechanical
Coating Material........ A. Dipped in Synthetic Rubber to Seal and Webb Coil, Preventing Distortion
B. 1. PVC Covering
2. Mil-Spec MPQ-2000, A Solvent and Acid Resistant Covering.
Radiating Element....... A. Helical Wound Hardened Steel Wire, Copper Plated for Lower Resistance and Higher Velocity
B. .125 dia High Carbon Steel, Bias Wound Flexible Shaft Core-Plated

THE TUNED ANTENNA
"Quality Through Technology"

Availabe from 136-174 MHZ
Availabe from 210-250 MHZ
Availabe from 440-470 MHZ
1/2 WAVE 2M
DUAL BAND 270A

FOR DEALER LOCATION CALL (619) 579-8916
SMILEY ANTENNA CO., INC. 408 LA CRESTA HEIGHTS ROAD EL CAJON, CA 92021

Chen Ping BA1HAM has circulated a draft proposal. If adopted, a Technical Session would be added to regional and national championships. It would be separate from the existing 80m CW and 2m AM events, with separate competitor categories and prizes. **Table 1** shows my comparison between rules for the traditional 2m run and the Technical Session. The proposal text can be downloaded from the "Homing In" Web site.

Technical Session courses would be smaller than those of other IARU foxhunts, so they could be held in city parks and school grounds. Besides the obvious convenience, a small course makes the outcome more dependent on RDF skills and less on the ability to run fast. Other features would make it possible for visitors and observers to be on the grounds during the event and for contestants to use commonly available VHF-FM receivers and scanners.

Note that age categories are slightly different from mainstream IARU foxhunts, to recognize the differences in technical abilities between children and teenagers. Furthermore, entrants in all Technical Session categories are expected to find all foxes; the number is not reduced for any category.

As an additional incentive to improve RDF abilities, foxes would be truly hidden, with no prominent flags nearby. Numbered markers replace the present orienteering punches. Competitors would write down the number on their cards when they find a fox. To make sure that hunters use their RDF gear instead of just their eyes, there would be many dummy markers in the field. Hunters who write down a dummy number on the card instead of a correct number will score lower.

The Chinese are by far the strongest ARDF competitors in IARU Region 3. They took individual and team gold medals at the Championships in Australia last summer. BA1HAM is Chairman of the IARU Region 3 ARDF Committee. Thus you can be sure that the Technical Session proposal will be given serious consideration by radio-orienteers worldwide.

Subscribe to
73 Magazine
the easy way...
call 800-274-7373 or
FAX 603-924-8613.

I like the proposal, because it sanctions foxhunts in local venues with commonly available equipment. However, I would like a more descriptive name such as Short Course or FM Event. Furthermore, I suggest that voice identification be permitted to replace CW for some or all foxes at the event organizers' discretion. Voice memory ICs are plentiful and inexpensive, making talking foxes more practical than ever. They would encourage non-hams and no-code licensees to try ARDF.

"The entire hunt area should be free of hazards such as highways, railroads, and dangerous animals."

The only problem that I envision is security of the marker numbers. Runners should be cautioned to keep their cards concealed so that others on the course cannot see the marker numbers written on them. Course marshals must be watchful to prevent collusion among team members by sharing of numbers. Do you have any ideas for a simple but more secure verification system?

Let's try it

The Technical Session structure is ideal for a foxhunt at the site of your next hamfest or club picnic. So why not hold one? Let's try the proposed rules and see how they work. If you can't put out a dozen foxes, try it with a half dozen or fewer. Here's how to do it:

Visit the site in advance to choose a starting area and a finish area. If everyone starts at the same time, the start and finish can be at the same place. Putting the start/finish area at the center of the venue will encourage hunters to scatter instead of follow one another.

It is not necessary that all foxes be copyable from the start point, but at least half of them should be. The entire hunt area should be free of hazards such as highways, railroads, and dangerous animals. Mark on the map any area with hazards so that no one will venture there.

Make up carry-along cards to give each hunter. There should be a square on the card for each fox, into which the hunters will write the control number for that fox. Standard orienteering cards by Silva have 20 squares and are ideal for this purpose.

The easiest way to make foxes for a Technical Session is to borrow some handie-talkies. Older models such as the Icom IC-2A are perfect, because bells and whistles such as CTCSS are unnecessary. Voice ID can come from an audio chip; on/off timing can be synchronized by a CMOS 555 timer IC. For more controller ideas, see the "Homing In" Web site.

Foxes should transmit for only a few seconds, about twice a minute, sending a distinctive letter in CW or voice. It is OK if transmitters occasionally QRM one another, but try to randomize the timing so that this does not occur on every transmission. Use multiple frequencies only if equipment limitations such as rock-bound transmitters prevent foxes from all being on the same frequency.

Ideally, foxes should begin to cycle just as the hunt starts, so no one can hear them earlier. The versatile PicCon controller described last month can be programmed to start and stop at predetermined times, but most other fox controllers cannot. It may suffice to hold the hunt on an obscure frequency that is not announced until starting time. Forbid hunters from turning on their receivers until then.

Make up about fifty 4-by-6-inch index cards with different 3-digit numbers on them, to be used as control cards. Put the foxes out well in advance so potential hunters won't see you deploying them. Place a control card within six feet of each fox, secured to prevent it from blowing away in the wind. Put out and secure the remainder of the cards at interesting places where hunters might guess that a fox would be located.

Have each hunter register on a roster. Add columns to the roster for start and finish times and number of foxes found. If you have a large enough number of participants, break them into categories with separate prizes for each, to even the field. The Chinese proposal for categories is in **Table 1**, but you could choose differently, as determined by your club's demographics and its opinions about fairness.

Instruct the hunters that they must not turn on their equipment until they begin to hunt. Tell them the hunt frequency and the number of transmitters, plus how the foxes are modulated and identified (voice, CW, letters, numbers, callsigns, and so forth). Give out maps of the hunt area showing boundaries, roads, buildings, terrain features and any forbidden areas.

Start the hunt and begin timing. Make sure you have sufficient help at the finish line to write down exact ending times of each finisher on his or her card and the roster. (The time of finding each fox is not important, just the time that the hunter crosses the finish line.)

Primary scoring criteria is the number of foxes correctly identified by control number. The secondary criterion is time. In a 12-fox hunt, the first to find all twelve wins, followed in time order by all who find twelve, then in time order by all who find eleven, and so forth.

Please let me know what you think of the Chinese proposal. I especially want to hear from clubs that actually try out the Technical Session. I will pass along your results and suggestions to the ARDF Committees of Regions 1 and 3. Send E-mail to: Homingin@aol.com or postal mail to the address at the beginning of this article. Who knows? Maybe there's a future ARDF World Champion in your town!

Number 79 on your Feedback card

ABOVE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave
San Diego CA 92119
clhough@aol.com

The VHF/UHF beam antenna

This month, let's cover the construction of an antenna for the 70 cm (432 MHz) amateur band. I didn't want to put together a long-boomer type of antenna with 25 to 32 elements. I wanted to construct a 10- or so element beam on a boom length of six feet. A modest antenna by any measure—not a killer beam. The target price to beat when making a comparison to a commercially available similar antenna was $90 to $100.

I found a good starting point in an article in the May 1989 issue of *Ham Radio Magazine* (pg. 9, K1FO). The task begins by putting together a shopping list of the major components: 1-inch aluminum boom material and a selection of two different tubing sizes for the elements. A larger size is needed for the driven element and still another smaller size for all the others. The ratio of the larger to the smaller diameter should be about 2:1. That is, if 1/4-inch tubing is used for the driven element, the "T"-match section used for the feed arrangement should be 1/8-inch-diameter. The entire antenna is constructed using the 1/8-inch material for all elements except, of course, the driven one. This is constructed from 1/4-inch aluminum rod or tubing. Only a short piece less than 14 inches long is needed for the construction of one antenna.

Other materials recommended in the article were some fasteners to hold the elements in place and an insulating rod to insulate the driven element from the boom. A bracket needs to be constructed out of a small scrap of aluminum to hold an "N"-type female coaxial connector. To this bracket and connector a 1/4-wavelength coax balun is attached which in turn makes connection to the 1/8-inch "T" part of the antenna feed system.

The feed system of the antenna is attached to 1/2-inch insulating standoffs bolted to the bottom bolt holes of the "N" connector. The connector and its mounting bracket are positioned on the boom so as to place the ends of the standoffs and the attached 1/8-inch "T" rods over the center of the 1/4-inch driven element. The ends of the 1/8-inch rods are pounded flat to accept a 6/32 screw to attach them to the standoffs. The far ends of the 1/8-inch rods are held in place with a strap made from 1/4-inch-wide thin aluminum bent over to the elements and held in place with the 6/32 screws.

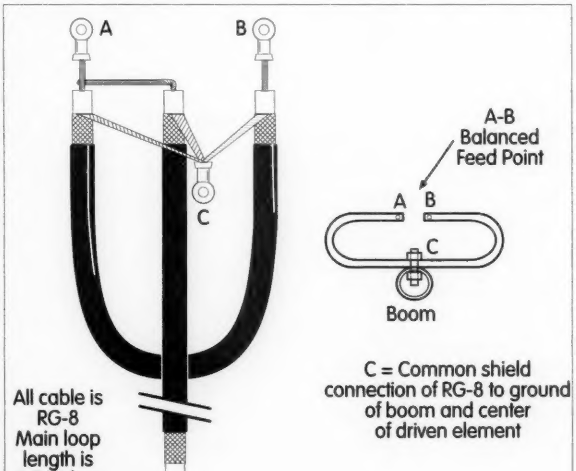

A
B
C
A-B Balanced Feed Point
A
B
C
Boom
C = Common shield connection of RG-8 to ground of boom and center of driven element
All cable is RG-8 Main loop length is 9.5 inches

Fig. 1. RG-8U coax balun for 432 MHz is 9.5 inches long, converts 50Ω unbalanced to high-Z balanced configuration.

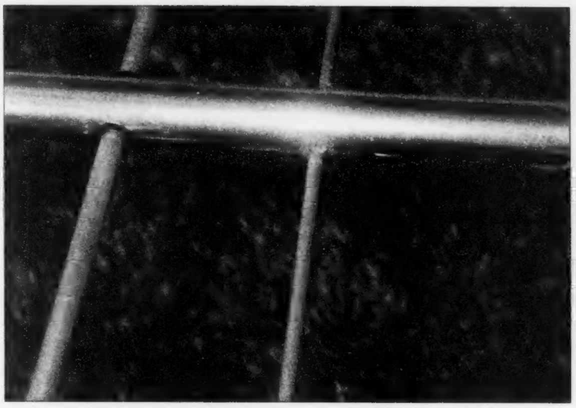


***Photo A.** Close-up of new antenna construction showing black-insulated driven element and lighter color (silver) Auveco push-on retainer for smaller driven one.*

The RG-8 coax feed is fitted with a balun of 1/2 wavelength of coax. To figure out how long 1/2 wavelength is, divide your desired frequency into 300. That is, 300/432 = wavelength in meters, or in this case, .694444 (or more commonly, 70 centimeters) for one wavelength. Divide 70 cm/2 = 35 cm. At 2.54 cm per inch, 35/2.54= 13.77 inches multiplied by the velocity factor of coax (.69) = 1/2 wavelength of coax for our balun 9.5 inches long (see **Fig. 1**).

Wow! Lots of things to accomplish in the construction of this 432 MHz 10-element beam, and we haven't even started to drill holes. Let's look at the assembly of the components and examine the process. I started out to locate a source of 1-inch aluminum thin wall tubing and small-diameter material suitable for the element construction. On my first telephone call, I was able to locate tubing in 12-foot lengths of 7/8-inch material for $7. There was no stock of small-diameter tubing at this source, so I had to make other calls to attempt to locate the material for the elements.

I was trying to keep the materials sourcing in my local area in order to limit excessive mileage costs from picking up all the components needed. I felt that since I lived in a reasonably large manufacturing area spotted with hi-tech materials suppliers, such supplies should not be too hard to find. However, locating small-diameter tubing proved to be difficult. I was able to locate 1/4-inch and 3/16-inch solid aluminum rod at one dealer, but finally ended up purchasing 1/8-inch solid rod at another. All material was in 12-foot lengths. Total cost for the small diameter rod, $8.25.

Materials still on the shopping list included insulating bushings for the driven element; hold-down fasteners for the elements; small bits and pieces like nuts and bolts; and a "U"-bolt bracket to hold the antenna boom to the mast pipe. And, we still needed to construct a coaxial balun 1/2-wavelength long.

Well, according to documentation on this antenna which was reprinted in *The ARRL Handbook* from the original old *Ham Radio Magazine*, the fasteners for the elements could be obtained at any well stocked hardware store. They were made by Auveco Products. *However*, if I had known all along what I know now—that Au-ve-co stands for Automotive Vehicle (products) Company—my search for the fasteners would have been made more than a little bit easier.

I called hardware wholesalers and came up blank trying to find these fasteners. They are similar to the push-on retaining nuts used in the construction of a child's wagon, except that they do not incorporate the hood of the jam nut. The desired fasteners are like a shakeproof washer that has internal fingers bent out in a cone shape of a particular diameter. This cone shape enables these washers to be slipped over a rod to firmly grasp it in position. Each element is then centered between two such devices to become locked in place (see **Photo A**).

Not only was I unable to locate the fasteners, but I also couldn't find anyone who thought I was sane. The largest hardware stores, in business for some 100 years, didn't know what I was talking about. If they didn't know, I was in trouble. Well, somewhere in my travels I had learned that these fasteners were not part of the normal nut and bolt trade but were instead automotive in nature. My first phone call to a large automotive parts warehouse landed me the phone number of a specialty nut and bolt firm, not listed in the Yellow Pages, that was located in another city and stocked automotive hardware. One call to them put me in touch with reality—they had stock of quite a number of Auveco fasteners.

Unfortunately, amidst all the excitement of getting ready to take my trip over there, I forgot to bring along samples of the elements and the diameters I needed to deal with. So just to be safe (and especially since I'd had to take time off from work to go to this place to begin with), I decided to ensure the success of the project by purchasing a small stockpile of fasteners in various sizes. Cost, $28. I most certainly overbought and will have these fasteners around for some time. I just wanted to cover all the bases.

This "run for the fasteners" trip took my memory cells back to the very early days when we used (steel) electrical conduit for boom material. The elements were 1/8-inch brass brazing rods and the method of attachment was simpler. We drilled a slightly undersized hole in the boom and then shoved the brazing rod through it, making a tight fit. Then, we drilled a second hole offset 90 degrees through the top of the boom for insertion of a sheet metal screw slightly off center from the brazing rod element. The sheet metal screw secured the brazing rod by jamming its threads along the side.

Electrical conduit (steel) for boom material was very inexpensive ($1/10 feet). Brass brazing rod or even aluminum clothesline solid wire could be used for elements. I used brass brazing rod 1/8-inch in diameter. If I remember correctly, the brass rod was a little short for 2-meter elements and I had to solder on some small-diameter tubing to lengthen them. However, for 220 and 432 MHz these smaller elements allow simple construction. Because this was to be a very economical beam antenna (costs held to a minimum), construction techniques were dictated by the materials on hand. Jamming sheet metal screws to hold elements tight to the boom will eventually result in rust, but the method works and will last quite a long time.

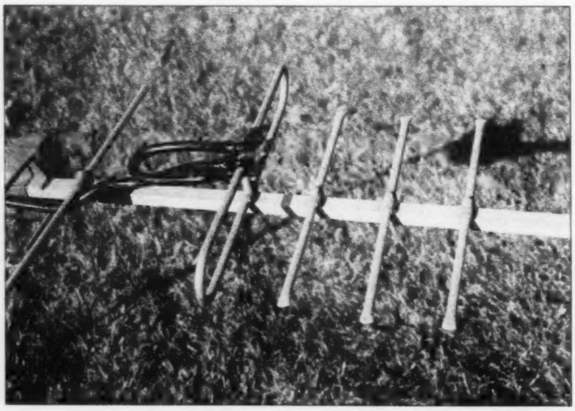


***Photo B**. Repaired 432 MHz beam antenna with balun attached. Antenna with broken elements was purchased at a swap meet for $1.*

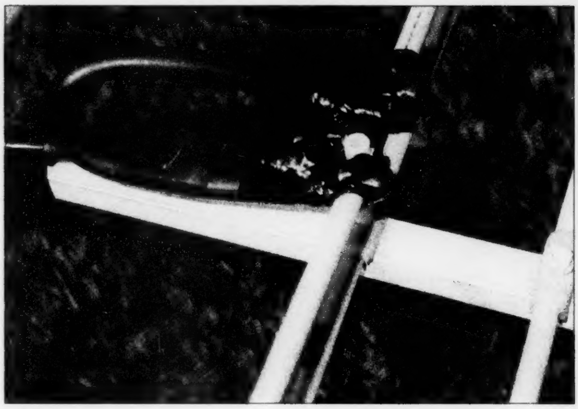


***Photo C**. Close-up of new balum assembly for salvaged antenna, constructed from 9 inches of RG-8 coax.*

The rusty connection will not disturb basic antenna operation but will in time become a simple diode. This diode in many cases will actually become a very good mixer. When joined with some metal (the elements), it allows two transmitters to mix together to produce an interference product. While the product is not very strong, it is capable of being detected by the very sensitive receivers we use for communications today. The modulation that is passed is usually that of the capturing (strongest) signal being mixed.

This mix product can be sufficiently strong to be received quite a distance from the mixing device. The only cure is to remove the rust (mixer) or to bond the metal together to eliminate the rusty connection.

I once came across an example of this in the commercial realm, involving a city emergency frequency and a radio taxi company's commercial one. The problem went unnoticed for many years because at that time mobile transmitters were not left on all the time but instead were activated only when needed. Because the offending transmitters both need to be on the air to observe the mix products, it took quite a bit of air time to discover just what signals were mixing. The mixing culprit in this case turned out to be a city water tower that was assembled with nut-and-bolt construction.

Now, these bolts were quite large and over the many years since construction had become rusty and painted over. This condition made the water tower a better transmitter at VHF than some conventional low-power transmitters. Turning on both transmitters and DFing to the water tower on the interference product became simple. The solution to this perplexing problem was to weld the bolts themselves to the metal water tower structure. Amateur locations can be just as susceptible to this type of problem as commercial radio sites are.

Well, what conclusion did I reach from trying to build a beam antenna and from all the effort needed for home construction? Being a junk box addict, I still opt to construct my own antennas when possible, but I will temper the construction methods used and not go every time for the ideal components to use.

The up side of this whole construction affair was that my partner in electronics experimentation Kerry N6IZW had picked up a small 400 MHz beam at a swap meet for $1 (see **Photo B**). It was missing the driven element and matching section, but I constructed a balun from a short section of RG-8 (**Photo C**) and replaced the broken element with some scrap aluminum. Testing the antenna showed resonances at the 432 MHz SSB frequencies (1.2:1) and still a good match (1.5 to 1) up into the 440 MHz FM region.

That's it for this month. Has the newly constructed antenna functioned well? Well, no: I haven't constructed the feed arrangement yet. When it's tested, I will let you know. Is it better to purchase a small antenna or construct one? This time around, it was too time-intensive to build, so we bought used instead. Next time, who knows? 73, Chuck WB6IGP.

Build a Colloidal Silver Generator

continued from page 25

Colloidal Silver Generator Parts List	
Component	**Radio Shack #**
Transformer, 24V 450 mA	273-1366
Switch	275-634
AC cord	278-1255
Fuse Block	270-739
1/4 A fuse	270-1002
Bridge rectifier, DIP	276-1161
7805 regulator	276-1770
Green LED	276-022
Neon lamp	272-707
1,000 µF 50 V capacitor	272-1047
270 Ω resistor	271-1314
Plastic box	270-224
Binder post jacks	274-661
Fine (.999) silver is available from Holtzer & Miller Co., (800) 462-7747	
Bare circuit boards are available from FAR Circuits, 18N640 Field Court, Dundee IL 60118, (847) 836-9148	
Parts kits, silver electrodes, and assembled and tested circuits are available—contact the author for details	

Laser Backscatter Tester Parts List	
Component	**Radio Shack #**
741 op amp	276-007
10 k pot	271-282
.1 µF capacitor	272-1069
.01 µF capacitor	272-1065
Switch, double pole	275-636
Battery snaps	270-324
Solar cell*	276-124
Plastic box	270-224
0-1 mA meter**	270-1754
680 kΩ resistor***	N.A.
*The plastic bubble used to package the solar cell is used for the sample tray.	
**This meter is marked "0-15 VDC" but includes an external 15 k resistor. DO NOT use the external resistor.	
***Radio Shack does not carry a 680 k resistor. It is available from other sources, or connect a 470 k and a 220 k in series.	
Visible diode LASER module is available from M.P. Jones & Associates, Inc., (800) 652-6733. The part number is 6996-LZ.	

Disclaimer

As an ebonics-speaking friend of mine might say, "I don't want no f— trouble from de mf— FDA." This is mostly an electronics-oriented journal, so if someone you know wants to mess around with silver (or other metal) colloids, and is too ignorant to hook three little batteries together to make 'em, you can probably help them by building this simple circuit.

The alternative health-care ("this is a food supplement, not a medicine") field is no more honest than our commercial medical industry—it just isn't backed with the strong arm (a.k.a. swat teams) of the law, as enforced by the FBI, FDA, NIH, WHO, and so on through the Washington alphabet.

With the exception of a warning by Dr. William Douglass in his Second Opinion *newsletter, everything else I've read has encouraged people to take silver colloids internally. Douglass, whom I respect, even though he doesn't answer his mail, says silver is a dangerous toxic metal. If there are any studies which show silver to be toxic, I haven't seen them referenced yet—maybe you can research this and let me know.*

Meanwhile, I am not recommending that you chugalug silver colloids, nor is the author of the article. If you do it and find wonderful health benefits, that's your decision. If you swallow the stuff and your teeth turn black, I don't want to hear any whining. If it kills you, well, we all have to go sometime, right?

I'm working on a booklet on how to make and use silver colloids, so I'd appreciate anything you can find about using it, pro and con. This is yet another case of where, despite a bunch of evidence supporting the value of silver colloids, the medical industry has refused (as far as I've been able to find out) to research their potential—presumably because the results could not be patented and sold for egregious profits...Wayne.

NEVER SAY DIE

Continued from page 63

keeps meat put in a pyramid-shaped container from rotting and which also sharpens razor blades. If the effect is a delusion, then it is able to delude an electron microscope. Check page 176ff for details. Okay, smarty, how can a small cardboard or Plexiglas pyramid sharpen a razor blade or mummify meat?

The normal scientific approach is to declare that all researchers claiming such an unexplainable effect have made errors.

So how about dowsing? Thousands of years of dowsing studies are all flawed, right? Sure.

Then we have the work of Wilhelm Reich and his orgone generators. Our beloved government put Reich in prison (where he kind of died) and destroyed his laboratory and orgone generators. A friend of mine, Dr. Charles Dockum, with whom I worked on a Guggenheim Grant project for the Guggenheim Museum on Fifth Avenue, built

Continued on page 83

Handheld Repeater Controller

Spectrum Electronic Products introduces the world's first handheld repeater controller. No larger than most handheld radios, the **HRC-10** converts a single or dual-band radio into a full featured simplex or duplex repeater system. Key features of the **HRC-10** include voice IDer, DTMF Control and programming, hang and time-out timers, Digital Voice Operated Squelch (DVOS™), telemetry tones, and private voice mail slot. **$299**

http://www.spectrum-usa.com
800-566-2788 - fax 408-336-9461

CIRCLE 69 ON READER SERVICE CARD

HamCall™ CD-ROM
U.S. & International - Over 1,362,000 listings

The New October 1996 edition is now available! Over 140,000 new/updated International Listings.

The HamCall CD-ROM allows you to look up over 1,362,000 callsigns from all over the world. The same CD works in DOS, Windows 3.x, Windows 95, and Macintosh.

On a PC running Windows or DOS, you can look up hams by call, name, address, city, state, ZIP, call sign suffix, and county. PC's can also view photographs, EDIT records, and calculate BEAM HEADING and DISTANCE. Macs can retreive by call, last name, and ZIP, and now view photos.

- Supported by many BBS systems and logging programs.
- Displays latitude/longitude for most countries based on city or town for greater accuracy.
- Calculates beam heading and distance from your home QTH automatically.
- Prints standard 1-up labels for QSL cards.

Also on HamCall are over 130,000 cross references from old to new calls, over 3,000 photographs, over 16,000 e-mail addresses, and much, much more. We will publish your PHOTO or QSL card for free, just send it along with a signed permission slip allowing us to use it in our products. Price remains $50.00 plus $5.00 shipping U.S. and $8.00 international shipping.

*Specifications subject to change without notice.

BUCKMASTER
6196 Jefferson Highway
Mineral VA 23117
540 894-5777 • 800 282-5628 • 540 894-9141 (FAX)
E-mail: info@buck.com

CIRCLE 56 ON READER SERVICE CARD

POWER POCKET

12V/2.0 Amp Hours of dependable power, in a convenient soft case. Simply insert the cigarette adapter plug normally used in your car's lighter to instead plug into the POWER POCKET. The POWER POCKET provides hours of extended talk time, up to 6 times longer than standard battery packs!

- Emergencies – Special Events – Search & Rescue – Hiking – Cycling – Hamfests – Field Day – Etc.

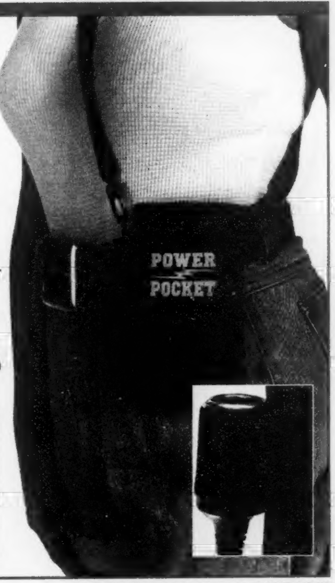
Without power, your HT is useless! Don't be caught without a POWER POCKET when you need it most.

- Compact slim design that is light weight, only 30 ozs., with a belt loop and shoulder strap included.
- 110V Wall Charger included. Charge rate: 6-8 hours from complete discharge.
- Sealed lead acid case, can be recharged to 100% without memory effect of NiCads.

The POWER POCKET is available from most major Amateur Radio Dealers, or contact:

NCG COMPANY
1275 N. Grove Street
Anaheim, CA 92805
(800) 962-2611
(714) 630-4541
Fax (714) 630-7024

CIRCLE 54 ON READER SERVICE CARD



Number 82 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
P. O. Box 473
Stevenson MD 21153

New technology

With all the recent comings and goings in the amateur radio market, it's exciting to be able to talk about one of the most innovative technologies to come down the pike in years.

We are all familiar with the common types of modulation forms in use to transmit radioteletype over the air. The classic, most common, method is frequency shift keying, of course, with a MARK and SPACE signal used to represent the two states of the RTTY loop. With the traditional method of encoding Baudot five-level code at 60 words per minute, or 45.45 bauds, each pulse lasts 22 mSec, and has a square waveshape.

It has come to my attention that cutting-edge amateurs have been able to impress a second digital signal on the flat top of each 22 mSec pulse. This allows a phase shifting signal to ride on top of the amplitude modulation of the radioteletype signal. The utility of this quickly becomes obvious when a logarithmic form of encoding is used, with inversion of the impressed amplitude on the wave top.

A practical application currently under investigation allows a computer-linked, object-oriented graphic to be fixed in linkage to the frequency-shift-keyed signal. By splitting this object off during reception, real-time graphics are now possible over a low-bandwidth, 45.45-baud signal.

I look forward to being able to tell you more about this technology, officially called the Amplitude/Phase Ratio, Inverse Log, Fixed-Object-Oriented Linked System, within the next several months. Stay tuned!

On a more direct note

Hugh Phillips K7XM writes that he is looking for a good standalone RTTY program to use with his (late) AEA PK-232. Well, Hugh, several programs, including LanLink, PakTerm, and PaketPet all come to mind. Each has its own flavor, and each its advocates and critics. But that's, as I tell my children, why Baskin-Robbins has 31 flavors. Check out the various programs available in the RTTY Loop Software Collection—I'll remind you how later—and see if one, or more, doesn't suit your fancy.

Another message from T. John Lewis VE3LGS, addresses the problem of the ham not living in the United States. He says: "I have been an avid reader of RTTY Loop for many years but in the past few have gotten away from real RTTY to the 'fad' modes. I would like to get back on RTTY. I have several TUs just gathering dust which work perfectly. I see that you have a program called AUTORT on a disk you mail out to persons who send an SASE and US$ to you by mail. Since it is impossible to get US stamps here in Canada without driving to the USA, I wonder if there is another easier way. Is there an Internet address where it can be downloaded?"

John, although I have been trying to get a number of programs up "live" on the RTTY Loop home page, space considerations prevent me from having them all on-line at the same time. After all, there are more than 20 Mb of programs and data, quite a bit more than the space allotted by my Internet Service Provider. I understand the problem, though, of folks who may want just one program, or who have problems with stamps or mailers. If you need just one program, I can attach it to an E-mail reply, presuming you can download binary files from the Web. If you only have a text service, such as some of the "freemail" servers, you may not be able to retrieve such files. They are a bit long to UUENCODE, so getting a disk the old-fashioned way may be your only solution at that point. If you have a question, drop me a line. Let's talk.

As the communication wave spreads out from the Internet, there is bound to be some confusion among those not familiar with amateur radio. I received the following questions, which I have massaged a bit for the purposes of generality, and present them here, with answers. Maybe one or two of these will help you in discussing digital matters with friends and coworkers.

> ***"This new technology is officially called the Amplitude/Phase Ratio, Inverse Log, Fixed-Object-Oriented Linked System..."***

Q. Is there a way of accessing some of the ham resources on AOL and CompuServe if you have another Internet service provider? AOL and CompuServe are only available overseas through an expensive phone call.

A. While both AOL and CompuServe are normally accessed via their own telephone networks, both can now be accessed by subscribers via the Internet as well. I would advise checking the Internet home pages of each service (http://www.aol.com and http://www.compuserve.com, respectively) to look into these options. Offhand, I don't see why Internet access should not be available to non-USA users.

Q. I am about to retire and go sailing. While I am practicing my Morse code and may succeed in getting an amateur license before I leave, may I operate an SSB radio aboard ship while yet unlicensed?

A. Not on amateur bands, you can't! Get that ticket first!

Q. May I operate an amateur radio aboard the boat while unlicensed using only those frequencies which have been allocated for marine SSB telephony?

A. Amateur is amateur and marine is marine. One has nothing to do with the other. If you want to operate on amateur frequencies, you need an amateur license.

The bottom line is not to confuse the two services. The radios may look alike, and the signals may sound alike, but they are different animals.

And finally, I received a question about a PK-80 given to a ham who did not pass along his name. He wondered if this unit, originally designed for the Radio Shack TRS-80, would work with a current PC-type computer. You know what? I don't know! As I recall, the PK-80 was a simple interface, which depended on software programming to perform the digital conversions. Offhand, I don't see why, with suitable software, the PK-80 wouldn't work with a PC. I look forward to reader input on this one.

I mentioned the RTTY Loop Software Collection. This sixteen-disk (as of this writing) collection of RTTY software and utilities features a wide variety of programs of interest to digital amateur. On-line amateurs can check out the list on the RTTY Loop home page at http://www2.ari.net/ajr/rtty/. If you cannot connect, a self-addressed stamped envelope to the post office box above will get you a printed listing. Either way will fill you in on the details of how to obtain any of the disks of the collection. I welcome your comments, questions, suggestions, and critiques at the P.O. box, or via E-mail at ajr@ari.net.

Next month, I'll try to pry my tongue out of my cheek, or have you not understood the opening paragraphs yet?

NEVER SAY DIE

Continued from page 81

a small orgone generator and used it to cure a wide range of illnesses for friends. They're very easy to build, by the way.

More hokum? Or anomalies worthy of investigation?

The government certainly isn't going to fund research into weirdom like this, nor are any large corporations, so that leaves it up to independent researchers. And since there are no experts in these fields, researchers are going to be amateurs, not professional scientists. But then, virtually every major new discovery in science has been made by an amateur, and all have been ridiculed and humiliated by the scientific elite (a.k.a. prestigious scientists) every inch of the way.

Another Gloom & Doomer

The Survival of Civilization by John Hamaker, Hamaker-Weaver Publishing, R1 B158, Seymour MO 65746; ISBN 0-941-55000-1, 1982, 218pp, $12. Hamaker is all upset over the rapid increase in CO_2 levels, predicting the end of the world. I want a second opinion. But he does make a good case for remineralizing the earth. A very good case. Ever since listening to the Dr. Wallach *Dead Doctors Don't Lie* tape, I've been looking for more information on the loss of minerals from our topsoil.

As Hamaker points out, to look at them you can't tell the difference between crops grown using NPK (chemical) fertilizers and remineralized crops, but one is healthy and the other sure isn't. So what's remineralization? This has to do with grinding up rocks to replace the minerals which have either been leached out of the soil, plus the minerals plants have extracted and which have not been returned. Once the farms were "played out" the farmers had to start using commercial fertilizers to keep their crops growing. The problem is that this robs us of the minerals our bodies need to keep healthy.

How effective is remineralizing the soil? The USDA ran a test with seven steers fed the usual fodder and another seven fed the exact same diet with 3.5% cement kiln dust added. The dust-fed animals gained 28% more weight and ate 21% less feed. Imagine how healthy you and your family might be if you were getting all the minerals your body was designed to use, but which you haven't been getting in your supermarket food!

The Federalist Papers

John Jay wrote that "Nations in general will make war whenever they have a prospect of getting anything by it." Pacifists should face up to that reality. Wars are prevented by making it too dangerous for others to attack you. Weakness produces subjugation, not peace. Our forefathers had no illusions about people. Madison wrote, "Enlightened statesmen will not always be at the helm." Amen! The Constitution was designed to take that into account and limit the damage that foolish leaders could do. When the Constitution is observed, it works pretty well. When federal judges ignore the Constitution or get particularly creative in interpreting it, we sure get into a heap of trouble. (My thanks to Thomas Sowell for bringing up the subject.)

History has continually confirmed John Jay's observation. As much as pacifists hate the idea, history has shown that strength is the best guarantor of peace, not unilateral disarmament—but can you think of any peace movements which have operated on this principle?

The idea, unsupported by history, that if people get to know one another they won't fight, has been kicking around peace movements for ages. So how come the Hutus in Rwanda were so easily incited to murder around 800,000 of their erstwhile friends and neighbors, the Tutsis? And just a couple of generations ago the Germans were able to wipe out millions of Jews and Gypsies? And so on.

So let's smile and be friendly Americans, but carry a big stick, to coin a phrase.

Sharks!

While in Aspen skiing, in January, Sherry bought some books at a secondhand store. One of them was a book that I've been wanting to buy for some time, *Sharks Don't Get Cancer* by Dr. Wm. Lane; Avery Publishing, 1993; 192pp; ISBN 0-895-29520-2; $12. Lane makes a very convincing case for shark cartilage being able to cure just about any cancer, as well as arthritis, psoriasis and macular degeneration.

As with other non-pharmaceutical remedies, the medical industry has been fighting this as quackery. Lane points out how reactionary the industry is. Despite endless claims for the Heimlich maneuver for choking victims, the American Red Cross refused to accept it for ten years, continuing to endorse back-slapping, which causes a stuck object to be even tighter stuck in the throat.

The money in the trillion-dollar medical industry (the most profitable industry in the US) is in drugs which can be patented, so if an illness isn't to be cured with a drug, there's no organization to research the proposed cure. Well, you ask, how about the National Cancer Institute? Surely they'll check out any proposed cancer cure, right? Wrongo. It turns out that the NCI "does not deal in cures for cancer, but only in the mechanisms of cancer." Maybe that helps to explain why so many reported cancer cures have been completely ignored by the NCI. And since about 50% of us are going to have a personal brush with cancer at some time in our lives, maybe we need to better educate ourselves and depend less religiously on our doctors.

Shark cartilage isn't patentable, so there's no pharmaceutical company to pony up the $231 million it costs to get a new drug okayed by the FDA, so you'll have to buy the stuff in health food stores as a dietary supplement.

But first, for heaven's sake read the book. It could save your life. Or, better yet, wait until you are almost dead from cancer or crippled with arthritis and *then* spend the $12.

ZL Media Flurry

When the results of an international test showed their students placing 14th in the world, the New Zealand media raised quite a fuss. But when American students placed 14 places below that, our media just ignored the matter. As the costs of communications and transportation keep dropping, much better educated workers in other countries are, more and more, going to be replacing American workers.

If you are an employer you know what I'm talking about. Finding educated workers with any motivation is getting to be almost impossible.

The bottom line is that your children are not going to get a decent education in a public school. At the very least you should be doing some home schooling to make up for this sorry situation, which is being vigorously protected by the teachers' unions.

Privacy Please

If someone is interested in assuming your identity all they have to do is get your name, current address, Social Security number, your previous address, your mother's maiden name, your birth date, and so on. This is all now available from Lexis-Nexis (Box 933, Dayton OH 45401) via their P-Trax data base. Yes, you can protect yourself. Call 888-965-3947 and request that your name be deleted. They'll tell you how to request the deletion in writing. If the wait is too long on the above number you can try 800-543-6862 and contact Andrew Bleh (blay) at extension 3385. His manager is Bill Fister at extension 1365.

Let me know how you make out.

Self-Abusers

Sherry pointed out that virtually all of the troubles I've had with employees stealing or causing me other serious problems has been from self-abusers. Smokers and alcoholics, who don't care enough to take care of themselves, are not likely to be good employees. This is a pretty good rule.

State of the Art

In late January I got a call from Art Bell W6OBB asking if I was game to appear on his talk show again. Sure. I knew what I was getting myself into, but the end seemed to justify the means. We talked for five hours, from 2 to 7 a.m. Eastern time. We started out talking about amateur radio and then wandered into cold fusion, my theories on aliens, how to make money, my list of books you're crazy if you don't read, the Bioelectrifier, silver colloids, and then more amateur radio. By the end of the day we'd had over a thousand phone calls asking for more information. These tapered off over the next few days, but then the mail began to pour in, if you call 300-400 letters a day a

Continued on page 84

QRX

Continued from page 8

FCC FCC Issues Issues

Imagine using your newly issued amateur radio callsign on the air, only to find out that someone else also has the same callsign! Of course, that's not supposed to happen. But it did, to at least a handful of newly licensed hams in the southeast US. The FCC blames the callsign snafu on computer problems.

The foul-ups started happening in mid-October. That's when the FCC issued the same callsign to several people who had just passed their license tests. Louise Williams KF4MTE of Newberry SC is a case in point. She was assigned KF4MTO on October 23rd—that same callsign wound up being issued seven days later to another woman in North Carolina. Two days after that, on November 2nd, KF4MTO was again assigned, this time to a woman in Tennessee. At least two other South Carolina hams had similar experiences.

The Commission was having computer problems for about a week, just before Gate 2 vanity callsigns were issued. A spokesman said he has no idea how many licenses may have been issued to more than one person. It's possible that there might be more hams who are unaware that they are operating with a license holding the wrong callsign. But the Commission's database has been corrected so that there are no callsigns with more than one holder. In the case of more than one person getting the same callsign, the last person to be assigned the callsign got to keep it.

An FCC spokesman says it appears that the problem of multiple people issued the same callsign is apparently limited to first-time licensees only.

Thanks to South Jersey Radio Assn. *Harmonics*, January 1997, which got it from *ARRL Electronic Letter & Newsline, Inc.*

Revamping of Emergency Broadcast System

The Emergency Broadcast System, or EBS, will soon give way to the Emergency Activation System, or EAS. The current EBS was instituted under President Kennedy in 1963 as a way of using telecommunications to alert the public to an emergency. This was a year after the Cuban missile crisis and its original intent was to allow the president to address the nation at a moment's notice in an emergency. Currently, stations put a test pattern or tone on the air and then announce that a test is under way. An eight-second, one-kilohertz tone signal follows. Finally, the audience is told that in the event of an actual emergency they would be given Civil Defense instructions.

The current EBS relies on a daisy-chain notification system, where one station receives the warning and then sends it on to the next station. That means if one station's equipment fails, others may not get the warning. The new Emergency Activation System depends more heavily on an approach similar to the World Wide Web. In the new system no station relies on just one source to receive the broadcast warnings. Rather, digitally encoded signals will activate computers at radio and TV stations and download emergency warnings.

From the January 1997 *PARKing Ticket*.

FCC Web Site

The FCC's Office of Public Affairs recently announced the establishment of a new page on the Commission's Internet Web site that will provide worldwide access via the Internet to live and recorded audio broadcasts of selected FCC events. The Commission began by broadcasting its December (1996) meeting through a RealAudio link on the FCC's home page. This site will also include a schedule of events, a comment form and an E-mail address to solicit ideas on how to improve or add to its usability. The site is http://www.fcc.gov/realaudio/.

TNX Rick KB7UFZ, "Odds 'N' Ends," *Maple Valley Hamlink*, January 1997.

RE: Insurance Claim #KNEBSO4GON

I am writing in response to your request for additional information.

In Block No. 3 of the accident report form, I put "poor planning" as the cause of the accident. You said in your letter that I should explain more fully, and I trust that the following details will be sufficient.

I am an amateur radio operator. On the day of the accident, I was working alone on the top section of my new 80-foot antenna tower. When I had completed the work, I discovered that I had, over the course of several trips up the tower, brought up about 300 lbs of tools and spare hardware. Rather than carry the now unneeded tools and material down by hand, I decided to lower the items in a small barrel by using a pulley which, fortunately, was attached to the top of the tower.

Securing the rope at ground level, I went to the top of the tower and loaded the tools and materials into the barrel. Then I went back to the ground and untied the rope, holding it tightly to ensure a slow descent of the 300 lbs. of tools. You will note in Block No. 11 of the accident form that I weigh 155 lbs. Surprised at being suddenly yanked off the ground, I lost my presence of mind and forgot to let go of the rope. Needless to say, I proceeded at a rather rapid rate up the side of the tower. In the vicinity of the 40-foot level, I met the barrel coming down. This explains my fractured skull and broken collarbone. Slowed only slightly, I continued my rapid ascent, not stopping until the fingers of my right hand were two knuckles deep into the pulley.

Fortunately, by this time I had regained my presence of mind and was able to hold tightly to the rope in spite of my pain. At approximately the same time, however, the barrel hit the ground and the bottom fell out of it. Without the tools, the barrel now weighed*20 lbs.

I refer you again to my weight in Block No. 11. As you might imagine, I began an abrupt descent down the side of the tower. Around the 40-foot level, I met the barrel coming up. This accounts for the two fractured ankles and the lacerations of my legs and lower body. The encounter with the barrel slowed me enough to lessen my injuries when I fell onto the pile of tools, and fortunately only three vertebrae were cracked. I am sorry to report, however, that as I lay there on the tools, in pain, unable to stand, and watching the empty barrel 80 ft. above me, I again lost my presence of mind. I let go of the rope.

TNX, *ARNS Bulletin*, February 1997, with additional TNX to *RadioActive*Notes*.

70 Cm Band Loss in Guatemala

Hams have lost out to commercial users of the 70 cm band in Guatemala, and the cost could be interference to ham radio satellite operations worldwide. This is because Guatemala now intends to put commercial operations across the band—commercial signals that will probably include the 70 cm satellite subband.

Manfred Kolbe TG9IKE reports via the *AMSAT News Service* that on Monday, November 18, 1996, the *Diario de Centro America* published the new law regulating all telecommunications in Guatemala. Part of the law removes ham radio access from all frequencies above 146 MHz except for tiny slivers in the gigahertz region.

The new law was created by a commission from the state-owned telecommunications company GUATEL, which consulted the Radio Club of Guatemala about the project. The commission was quite astonished to learn that ham operators operate some 20 satellites for global communications, and even more so when Guatemalan hams supplied a list of amateur satellites with operating frequencies and modes. The existence of the Amateur Satellite Service was also brought to the attention of the CEO of GUATEL. Also told was the chairman of the committee of Congress in charge of the new Guatemalan telecommunications law. He was even presented IARU and ITU documentation.

But even with all of this documentation, the decision was made to run the hams off and turn the spectrum over to moneymaking operations. As a result, the 70 cm band in Guatemala, which is composed of the frequencies between 430 to 440 MHz has now been declared available for commercial use only.

And it's not only Guatemalan hams who will face problems because of the change. There is likely to be heavy interference to Amateur Satellite Service operations in Region 2 when the transponders on various hamsats pick up commercial signals and rebroadcast them on other bands. Even for low orbiting satellites this will affect an area in southern Canada, all of the USA, Mexico, Central and South America down to Chile and Argentina. Taking into account the future operations of the Phase 3D ham satellite, the situation may even get a lot worse.

Lifted from *SARA* (Socorro Amateur Radio Assn.) *News*, January 1997, with TNX to *Newsline Radio*, CBBS Edition #1008, 12/6/96.

NEVER SAY DIE

Continued from page 83

pour. Since I had to open and answer them all, it was a pour for me.

But why am I the only one out there getting on talk radio and promoting amateur radio? There are thousands of talk shows and you're just sitting there like a lump on a stump, not doing your bit. Look, the ARRL has shown pretty clearly that *they're* not going to do anything to help get the public interested in amateur radio. The few promotions I've seen have been feel-good stuff for hams, not information for the public. The public doesn't remember a lot of what CB is, much less has ever heard of ham radio.

Yes, I know all the excuses. Rationalizations to explain why nothing is being done. Sure, kids are into the Internet. They're into computer games. Yatata yatata. Kids have always been interested in lots of things, but that didn't stop them from getting hooked on ham radio. I somehow managed to get involved with hamming even though I was also involved with dating, roller skating, reading books, photography (I spent endless hours in the school darkroom), singing (with the St. Paul's choristers, the Erasmus Hall Choral Club, and the Philharmonic Choir of Brooklyn), seeing every movie that came out, the Boy Scouts, and so on.

In high school I not only rehearsed every day with the Choral Club, I belonged to the Savoyards, where we put on Gilbert & Sullivan operettas, the book club, the camera club, and the radio club. I had plenty to do without amateur radio, but there I was, busily putting together ham and audio equipment in my workshop. I did that for years.

So don't whine to me about how kids are too busy today for amateur radio. What we need is a selling job. We're not pushing the product, so we're going to go out of business. You can't sell any product unless the public knows about it. That means visibility. National and local visibility. Are your ham club meetings announced in the local papers and on the community radio and TV announcements? How about posters in the local schools? On any local bulletin boards. On the Internet, for that matter? In Peterborough the local A&P has a bulletin board near the store exit.

How about getting after your ARRL director to get the League to do some national promotion? When is the last time you saw a story about the fun and adventure of amateur radio in a national magazine? Or a local paper, for that matter? Yes, I know, I'm repeating myself. Well, I *have* to, since you haven't done anything to make things change. And I'm going to keep after you to lean on the directors, to do all of the promotion you can locally, and to get your more talkative members into your local schools to acquaint the 5th graders with what we have to offer. Otherwise you're going to have to make do with CB fallout. That what you want?

Plenty of big organizations have blundered themselves out of business, so the ARRL could easily be blown away. The National Computer Congress ran the biggest show in the computer industry, often drawing around 100,000 attendees, packing New York, Las Vegas, Dallas, Atlanta and Chicago hotels. But they ignored the personal computer and were wiped out.

We need to get millions of kids interested in high-tech careers, and amateur radio is one of the easiest ways of doing that—but only if they're made aware that the hobby exists.

The people writing to me are subscribing to *73*, but they also want to know what books I can recommend they read to understand the fundamentals of electricity and radio. I've asked you to let me know which are the best books you've found so I can let them know. I haven't heard from you yet. Tsk.

Number 85 on your Feedback card

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls. The deadline for the June 1997 classified ad section is April 12th, 1997.

TOWER 100' guyed 2' triangular, 10' sections, MIL/AB-105C, ExHD Galvanizing. Dismantled, ready to go. Includes 1/4" guy wire, screw anchors. Excellent condition. Details Phone/FAX, **Jim W9GLR,** Polk City, FL. (941) 984-1317. BNB1600

LARGE ASSORTMENT of used test equipment. Most instruments are priced at 10% of original cost or less. Request list. **Jim Stevenson**, 3401 Sunny Slope Road, Bridgewater NJ 08807; (908) 722-6157, FAX: (908) 722-6391. BNB2084

RF TRANSISTORS, TUBES 2SC2879, 2SC1971, 2SC1972, MRF247, MRF455, MB8719, 2SC1307, 2SC2029, MRF454, 2SC3133, 4CX250B, 12DQ6, 6KG6A, Etc. **WESTGATE**, 1-800-213-4563. BNB6000

MAHLON LOOMIS, INVENTOR OF RADIO by Thomas Appleby (Copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM N3RF**, SVANHOLM RESEARCH LABORATORIES, P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. BNB420

BREAK THE CODE BARRIER: A self-hypnosis tape that allows you to learn or increase code speed easily and quickly. To order send $14.95 + $3.00 S&H to **Dr. Hal Goodman,** P.O. Box 184, Eastport ME 04631. For more info. send SASE or http://www.nemaine.com/w3uwh/morse.htm. BNB2031

HEATH COMPANY is selling photocopies of most Heathkit manuals. Only authorized source for copyright manuals. **Phone**: (616) 925-5899, 8-4 ET. BNB964

The PHDARA Hamfest 3 May 8-4 p.m. at the KC Market Center. **Bob WA0CLR** (816) 436-0069, wa0clr@juno.com or Box 28954, Kansas City, MO 64188-8954. BNB205

WANTED: G-VG+ cond older mobiles/hts:IC22A/S/U, 33U, 1C2/3/4A/AT, 13-509/76ers, most any non-mem synth rigs. Also xtals + assys for above. **Mark Whiteman N7TRZ,** NE 114 Ave., Portland OR 97220-2245, (503) 257-3820. BNB203

AUDIO EQUIPMENT WANTED: 1930s–1960s. Tube-type amplifiers, large or small speakers, mixers, microphones, tubes, parts, etc. Especially Western Electric, Jensen, Marantz, MacIntosh, J.B.L., etc. **1-800-251-5454.** BNB202

TIRED OF IRONING? PCB service. No $ setup, free scanning available. **FIRST PROTO**, 4201 University Drive, #102, Durham NC 27707; (919) 403-8243. BNB5005

ASTRON power supply, brand-new w/ warranty, RS20M $99, RS35M $145, RS50M $209. Call for other models. **(818) 286-0118.** BNB411

DSS BIBLE Volume 2. All new information — No duplication from Volume I. 200+ pages, 280+ files, $79.95 + $5.50 P+H. **DSS BIBLE Volume 1.** - $49.95 PPD. **DSS SECRETS**- All Patents $69.95. All $179.95.VISA/MC **TELECODE**1-520-726-2833. http://www.hackerscatalog.com. BNB1024

PRINTED CIRCUIT BOARDS for amateur radio and hobby projects. hhh://www.cl.ais.net/farcir or SASE **FAR CIRCUITS** 18N640 Field Ct., Dundee IL 60118, (847) 836-9148. BNB5013

BATTERY ANALYZER with PC interface. DOS or Windows Software $279. **LaMantia Products**, 1136 Aldersbrook Road, London ON, N6G 2X8. (519) 472-5566, FAX: (519) 472-1702. BNB910

Parenting

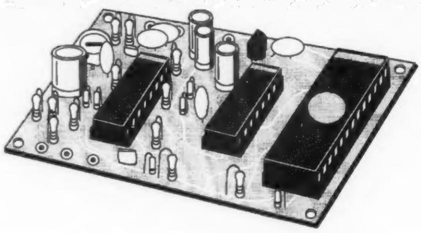
The most important skill we can build is in parenting. The one mark most of us leave behind is our children. Unfortunately, the parenting skill is no more intuitive than any other. And since this is probably the most important thing you're going to do in your life, the more you can learn about this skill the better. After all, when you make mistakes with your kids you are usually making permanent mistakes which will to some degree cripple them, or at least rob them of their full potential.

The cover feature on the February 3, 1997, edition of *Time*

Continued on page 88

Number 86 on your Feedback card

NEW PRODUCTS



New Hamtronics CWID Module

Ever since Hamtronics, Inc., introduced its slick low-power CMOS COR-4 module several years ago, customers have asked if they could get just the CWID part of the unit. They had different applications in mind: not just amateur repeaters, but beacon stations, commercial and public safety 2-way radio base stations, broadcast satellite uplinks—and so on.

Here it is: The new CWID-2 module features small size, ease of assembly and maintenance, versatility, and a thorough manual which describes how to take advantage of all the available options.

The CWID-2 uses all CMOS logic and operates on 7-15V at only 3 mA. It's easy to fit into existing enclosures because it's only 1-3/4 x 3-1/8 inches. The factory-programmed EPROM saves assembly time and allows longer messages than did their earlier diode-matrix type CWID module—up to 200 characters. The CWID-2 can also be set to repeat a message continuously for beacon operation.

For more details, write Hamtronics, Inc., 65-F Moul Road, Hilton NY 14468-9535. Phone (716) 392-9430 or FAX (716) 392-9420 and ask for a complete catalog.

Stop That Interference!

Don't let strong radio signals ruin the game (or sitcom, or soap) for you. Use the MFJ-711 high pass TVI filter between your cable and VCR or TV and wipe out TVI coming from broadcast, commercial, two-way, amateur and CB radios operating below 30 MHz.

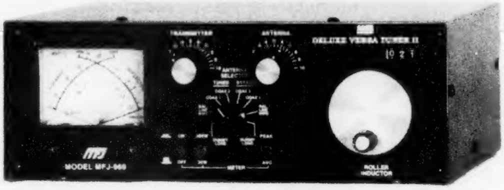
The MFJ-711 is protected by MFJ's famous "No Matter What™" one-year unconditional warranty, and it's only $24.95! See your dealer, or contact MFJ Enterprises, Inc., at 300 Industrial Park Road, Starkville MS 39759; phone (601) 323-5869 or FAX (601) 323-6551; order by calling toll-free (800) 647-1800.

It's a perfect gift for anyone who's tired of watching a messy TV screen—think Father's or Mother's Day—so use your highlighter and leave this copy of *73* in a prominent place!

191 AM Radio Log

The National Radio Club's 17th edition of their AM Radio Log is now available. Its 312 pages list the US and Canadian AM broadcast stations by frequency from 530-1660 kHz, with a cross reference by call letters and city. The listing includes the call, address, format, networks, phone, day and night powers, antenna, time zone, and slogans. With 191 listed stations on 1230 kHz, a person could make a career out of logging everything on one frequency. The list comes on 8-1/2" x 11" paper, punched for a binder. The club also has lists available of Latin American, European, and all other stations. Box 164, Mannsville NY 13661.

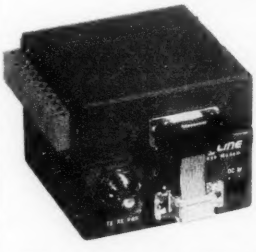
Absolute Minimum SWR



MFJ presents the world's only 300W AirCore™ roller inductor antenna tuner—the MFJ-969! It has all the great features of the MFJ-949E, plus the widest matching range of any full-featured antenna tuner and continuous 6m through 160m coverage. MFJ's AirCore roller inductor, a three-digit turns counter and spinner knob gives owners of the MFJ-969 exact inductance control; you get absolute minimum SWR, something you just can't get with a tapped inductor.

MFJ's QRM-Free Pre-Tune™ lets you pre-tune your MFJ-969 off the air into a built-in dummy load without causing QRM, making your actual antenna tuning faster and easier. There are scads of other features, and they all fit neatly into a scratch-proof black box less than a foot square—and it's only $179.95. For more information or the name of your nearest dealer, contact MFJ Enterprises, Inc., at 300 Industrial Park Road, Starkville MS 39759; call (601) 323-5869; FAX (601) 323-6551; visit the Web site at http://mfjenterprises.com; or order toll-free at (800) 647-1800. Check it out. Absolutely.

New Skyline-RTU



RF Neulink introduces the new Skyline-RTU synthesized VHF transceiver, designed to make remote data control reliable and simple. Each RTU is a fully integrated subsystem that includes a transceiver, RS-232 modem interface and a digital/analog I/O board, all in a 3" x 3" x 2.5" steel enclosure.

The radio modem platform is the NEULINK 9600V, a high-speed 9.6 kBps 2-watt transceiver modem. Up to 64 channels can be programmed into internal memory. With its 65,000 unique ID codes, this synthesized VHF modem can be configured for point-to-point and point-to-multipoint networks. Frequencies available are 136-174 MHz, 218-230 MHz, and 260-280 MHz.

For additional information contact RF Neulink, 7610 Miramar Rd., San Diego CA 92126. Call (800) 233-1728 or (619) 549-6340; FAX (619) 549-6345; E-mail: rfneulink@aol.com

From Russia, with Low Noise

ЭЛЕКТРОННАЯ ЛАМПА

Svetlana Electron Devices, Inc., announces its EF86/6267 audio small-signal pentode. Manufactured in St. Petersburg, Russia, it's perfect for first gain stage in phono, guitar, or microphone preamps: The voltage gain in pentode connection is greater than 400. The EF86/6267 is designed for low noise, low microphonics, and low heater-cathode hum induction.

It's internally shielded, and the solid metal shield canister improves structure rigidity—you'll find it superior to the screen shields used in older versions of EF86. To learn more about other features of the EF86/6267, contact Svetlana at 3000 Alpine Road, Portola Valley CA 94028. Phone (415) 233-0429 or FAX (415) 233-0439.

Number 87 on your Feedback card

PROPAGATION

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

As this is being prepared (late January), the solar flux is still at a *very* low level (75) and there is no sign of improvement in propagation conditions that would lead to encouraging news for DXers in the immediate future. Conditions in April are likely to provide GOOD days on the 7th-10th, 14th, 15th and 22nd. POOR days are likely to be the 1st, 2nd, 18th, 19th, and 26th-29th. FAIR days are expected on the 4th, 5th and 24th. Days trending *adversely:* 11th, 12th, 17th, 25th, and 30th. Days trending *favorably:* 3rd, 6th, 13th, 20th, and 21st.

There is a possibility of very upset geophysical conditions on Earth on the 18th and 19th and the 26th through the 29th. These could be weather/atmospheric- or magnetic/ionospheric-related, or possibly combinations of these effects. As you can see, it is an interesting mix: five days trending adversely and five days trending favorably. There are seven Good days, three Fair days, and eight Poor days, so April represents an almost 50-50 split between favorable and unfavorable conditions. Therefore, you will have to keep a sharp lookout to make the best of opportunities, and continually monitor WWV at 18 minutes past any hour for the latest updates on magnetic field, ionospheric and solar flux values as they change—to either help or hinder.

10-12 meters

Generally Poor, except for occasional transequatorial propagation with F2 openings on the best days—most likely South and Central America.

15-17 meters

DX to Africa and Latin America on the Good days possible, with short-skip out to about 1,000 miles or so in the U.S.

20 meters

Your best band for DX openings around the world from dawn to dark, and openings to the Southern Hemisphere after dark in evening hours. You can expect excellent short-skip during the daytime to 2,500 miles or so.

30-40 meters

These bands ought to be open for DX from just before sunset to just after sunrise. Signals from the east should peak until midnight, and after midnight to other areas. Daylight short-skip of about 500 miles will be possible, and nighttime short-skip to 1,500 miles or more will be available.

80 meters

Occasional DX to various areas of the world should be possible between sunset and sunrise when QRN levels permit on Good (G) days (see calendar), as well as short-skip during hours of darkness to 1,500 miles or more.

160 meters

This band ought to begin to come alive again during the hours of darkness when QRN permits. Try the days marked (G) on the calendar for best results. DX toward the east until midnight, and to other areas afterwards until dawn. Short-skip to 1,500 miles will prevail when the band is quiet.

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
RUSSIA (C.I.S.)							20	20				
SOUTH AFRICA									15	15	15	
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
RUSSIA (C.I.S.)								20	20			
SOUTH AFRICA										15	15	20

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
RUSSIA (C.I.S.)									20			
SOUTH AFRICA										15	15	
EAST COAST		80	80	40	40	40	40	20	20	20		

APRIL 1997

SUN	MON	TUE	WED	THU	FRI	SAT
		1 P	2 P	3 P-F	4 F	5 F
6 F-G	7 G	8 G	9 G	10 G	11 G-F	12 F-P
13 F-G	14 G	15 G	16 G-F	17 F-P	18 P-VP	19 VP-P
20 P-F	21 F-G	22 G	23 G-F	24 F	25 F-P	26 P-VP
27 VP	28 VP	29 VP-P	30 P-F			

Note: U.S.A. Daylight Savings Time begins April 6.

Number 88 on your Feedback card

HAM HELP

We are happy to provide Ham Help free on a space-available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double-spaced, on a full 8-1/2" x 11" sheet of paper. Use upper- and lower-case letters where appropriate. Also, print numbers carefully. A 1, for example, can be misread as the letters I, i, l, or even the number 7. Specifically mention that your message is for the Ham Help column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Needed: Owner's manual, schematic diagram, or service manual for a Bearcat Model BC-8 scanner. Please contact *Glenn Torres KB5AYO, 584 Central Ave., Reserve LA 70084.* 73

NEVER SAY DIE

Continued from page 85

had to do with educating babies. It pointed out that there are windows of opportunity for kids to develop their brains. If they don't get the right stimulus at the right time, their brains do not develop normally and never will.

When I learned to horseback ride I found that virtually every intuitive response was wrong. Ditto when I learned to ski. Well, the same goes for bringing up kids, so if you don't get busy and start reading before you get involved with the most important project of your life, you are going to do irreparable damage.

The damage—permanent damage—can start even before conception. I've a number of really great books on this subject on my list of books you're crazy if you don't read, and I'll be adding a few more. Eventually I hope to have the time to write a book on the subject, but I'm not sure there are enough people who care how their kids turn out to make it worth my time.

How early should you start reading to your child? How about before birth? Music, too. One book I recommend explains how you can teach your child over a hundred words before it is born. Will your baby have heard Beethoven's and Sibelius' symphonies a bunch of times before being born? Rock music? Not if you've read what playing it does to plant growth! Yes, there's a book I recommend on that, too.

If you don't do anything to change our school system radically you're going to want to find a private school, and probably get your kid started at two or three years of age. Something like the Sudbury Valley School, with Montessori ideas thrown in.

Well, enough on that for now.

Eating It Raw

When I mentioned on the Art Bell show that I've shifted to a mostly raw food diet, and that I've found a great combo is to chop up (I use the Cuisinart) raw broccoli, cauliflower, and carrots into small crunchy bits, and then add some of my coleslaw dressing, I got a bunch of requests for the dressing recipe. In case you missed it a few months ago, it's simple and full of healthy stuff. Mostly. Take five parts plain yogurt, two parts apple cider vinegar, two parts extra-virgin olive oil, one part honey, one part light mayonnaise, salt and pepper to taste, and lace generously with celery seeds. My, it's good! It also makes a good dip for raw veggies. You can chop up cabbage and you've got coleslaw. It's a sauce, a dressing, and a dip. 73

73 wants your feedback...we've been improving *73* for the past months with more articles, easier reading type, etc. And honestly, we *need* your feedback (in detail) if you have any critique either for or against the subtle changes that we've made. We know we can't please everyone everytime, but if you tell us what you want *73* to be, we'll at least try to head in the direction for further "improvements" that might be most appealing to you. Thanks.

Radio Bookshop

Phone 800-274-7373 or 603-924-0058, FAX 603-924-8613, or see order form below for ordering information.

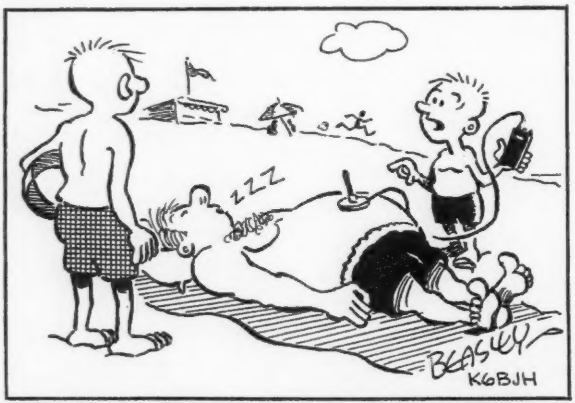
Wayne's Five Buck Books:

98 Books You're Crazy if You Don't Read. Brief reviews of books that will help make you healthy, wealthy, and wise. If you are sick you did it to yourself through messing up your body. This is probably the single most important five bucks you'll ever spend.

How to Make Money, A Beginner's Guide. Commuting to work is stupid. You can't get fired, laid off, downsized or outsourced if you own your own business. This is an instruction book on how to get others to pay you to learn what you need to know to be independently wealthy, have a ball doing it, and have that ham shack you've dreamed of.

Grist I. Fifty of Wayne's recent non-ham oriented editorials. They're about almost anything and guaranteed to almost make you think. You'll sure have things to talk about on the air other than your antenna and the weather.

Grist II. Fifty more non-ham editorials. Even more fascinating stuff to think and talk about.



I TRIED TO USE HIM AS A PARABOLIC REFLECTOR, BUT I THINK HE'S CURVED THE WRONG WAY !!

Radio Bookshop
ORDER FORM

You may order by mail, telephone, or fax. All payments are to be in US funds. Allow 4 weeks for delivery. (Prices subject to change without notice if suppliers increase prices or new editions cost us more.)

ITEM	TITLE	QTY	PRICE	TOTAL

Shipping: All orders add $5.00 handling *plus there is an additional at cost shipping charge added to all foreign orders. We ship UPS where possible, please give us street address.

S&H* ____

TOTAL $ ____

Make checks payable to "Radio Bookshop."

Foreign Orders: Choose one ☐ surface shipping ☐ air shipping

(Surface delivery may take 2-3 months.)

*Note: The actual foreign shipping costs will be additional to the regular shipping and handling fees.

Name ____ Phone ____

Address ____

City ____ State ____ Zip ____ Country ____

$10 minimum for credit card orders

Total Paid $ ☐Check/Money Order ☐AMEX ☐MC ☐VISA

Card # ____ Expires ____

Signature ____ Date ____

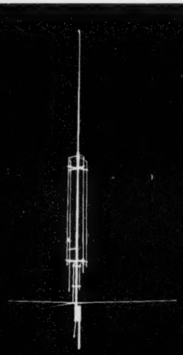
Telephone: 603-924-0058, 800-274-7373, FAX 603-924-8613

Mail: Radio Bookshop, Dept. 396, 70 Route 202 N, Peterborough NH 03458

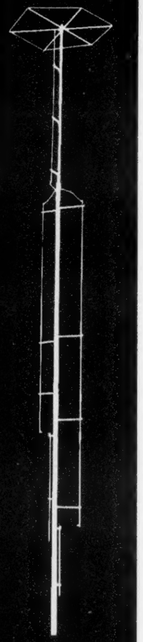
☐ YES, Send me 12 issues of 73 at the low rate of $24.97 (save 47% over the cover price). Canada add $7 plus $1.40 GST; Foreign add $19 surface; $42 airmail.

GAP: THE PERFECT ANTENNA

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.


Eagle DX

Challenger DX


Voyager DX

This chart helps you select the right GAP antenna. W hen comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

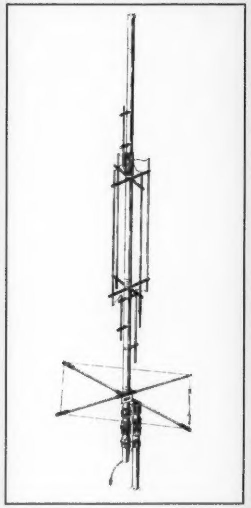
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Latest Release: **TITAN DX**



This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$259
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$299
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

GAP
ANTENNA
PRODUCTS INC.
6010 N. Old Dixie Hwy.
Vero Beach, FL 32967

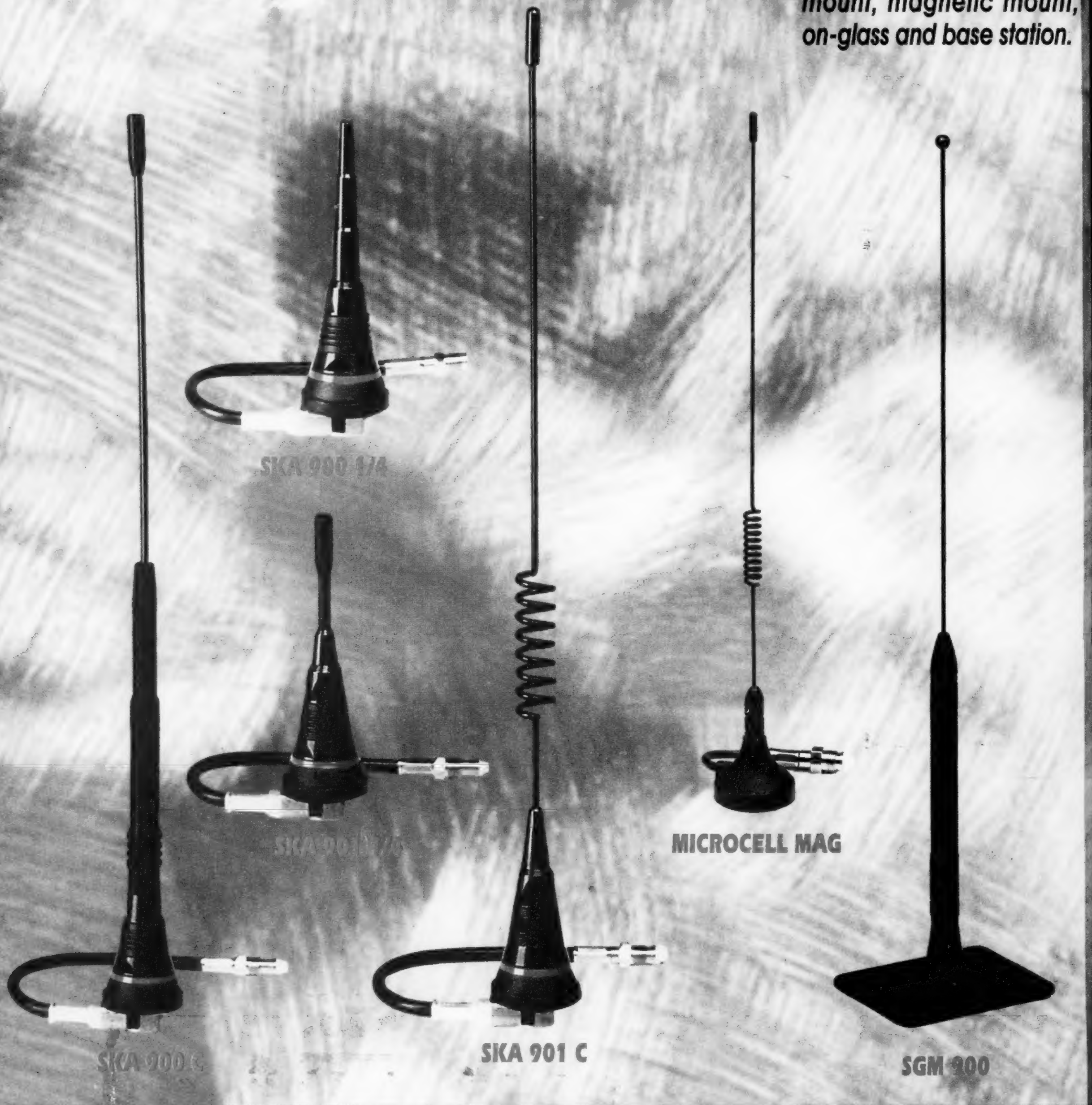
TO ORDER, CALL
(561) 778-3728

Come Visit Us At gapantenna.com

VISA DISCOVER COD

Connect to the world !!

A full range of cellular antennas is available: hole mount, magnetic mount, on-glass and base station.


SKA 900 1/4
SKA 901 1/4
MICROCELL MAG
SKA 900 C
SKA 901 C
SGM 900

SIRIO antenne 46049 VOLTA MANTOVANA - MN - ITALY - Tel. (39) 376/801515 - Fax (39) 376/801254
NORTH AMERICA OFFICE: TORONTO - CANADA - TEL. (519) 650 9277 - Fax (519) 650 1779